THE GAS JOURNAL

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A Glance at the Contents

Radiation plus Convection.

Views on the fire described by Herr J. Körting in our issue of Jan. 27 will be found in our correspondence columns. [pp. 299-300.]

Gas Engineer and Manager Required.

The Hinckley Urban District Council require an Engineer and Manager for their Gas Department. The commencing salary is £700 per annum. [p. 319.]

Gas on a Yacht Barge.

A keen enthusiast of gas, the owner of a yacht barge at present berthed at Maldon, Essex, has gas laid on for lighting, heating, and hot water supply. [p. 299.]

B.C.G.A. Meeting in Scotland.

The Annual Meeting of the members in Scotland of the British Commercial Gas Association was held on Friday, Jan. 29, in the Central Station Hotel, Glasgow. [p. 302.]

Chief Assistant Gas Engineer Required.

The Wallasey Gas and Water Department are inviting applications for the post of Chief Assistant Gas Engineer. The salary offered is £425 rising to £500 per annum. [p. 320.]

Coke in the Open Firegrate.

A correspondent criticizes the view of Mr. J. H. Dyde ("JOURNAL" for Jan. 20) that graded gas coke can only be burned in barless grates by maintaining an inordinately large fire. [p. 299.]

Vacancy for Distribution Superintendent.

The Borough of Morecambe and Heysham invite applications for the appointment of Distribution Superintendent to the Gas Undertaking. The salary offered is £260 per annum, and candidates must not be over 40 years of age. [p. 320.]

Engineer and Manager Required at Arbroath.

As will be seen from our advertisement columns, the Town Council of the Royal Burgh of Arbroath invite applications for the appointment of a Gas Engineer and Manager and Lighting Inspector for the Burgh at a salary of £400 per annum, with free house, coal, and gas. [p. 320.]

Exhausting and Governing Gas.

We publish to-day an interesting extract from a Thesis on this subject by Mr. Roy Summerson, of the Luton Gas Company (for which the author was awarded a Diploma of the Institution of Gas Engineers), which was presented at a meeting of the London and Southern District Junior Gas Association on Jan. 29. [p. 311.]

Spiral Gasholders.

Continued to-day is the treatise by Mr. S. M. Milbourne investigating from a mathematical standpoint, as far as possible, the main loads and stresses induced in the various members which constitute the spiral guided gasholder. The determination of the actual sections required to safely withstand these loads is then a matter of arithmetical computation and practical experience in design. [p. 305.]

Forthcoming Engagements

Feb. 18.—SOCIETY OF BRITISH GAS INDUSTRIES.—Council Meeting in the afternoon.

Feb. 19.—LONDON AND SOUTHERN DISTRICT JUNIOR ASSOCIATION.—Meeting in London. Paper by Mr. J. H. Escreet.

Feb. 19.—INSTITUTION OF CHEMICAL ENGINEERS.—Annual meeting in London. Dinner at the Hotel Victoria, 7 for 7.30 p.m.

Feb. 20.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Visit to Bingley. Paper by Mr. G. A. Winfield.

Feb. 23.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting at 2.30 p.m., 28, Grosvenor Gardens, S.W. 1.

Feb. 25.—JOINT JUNIOR GAS ASSOCIATIONS.—Visit to British Industries Fair, Birmingham.

Feb. 26.—JOINT GAS SALESMEN'S CIRCLES.—Visit to British Industries Fair, Birmingham.

March 1-3.—Joint Conference of the Society of British Gas Industries, British Commercial Gas Association, Institution of Gas Engineers, and National Gas Council, British Industries Fair, Birmingham.

March 2.—LONDON AND SOUTHERN DISTRICT JUNIOR ASSOCIATION.—Visit to Gothic Works of Messrs. Thomas Glover & Co., Ltd.

March 5.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Visit to Fife Coal Company's Brownhill Colliery, Cardenden. Address by Mr. H. Rule.

March 5.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Annual Business Meeting. Address by Mr. W. R. Cone, of the British Road Tar Association.

March 9.—Joint Visit of MANCHESTER AND YORKSHIRE JUNIOR ASSOCIATIONS to Messrs. W. & B. Cowan's Victory Works, Stretford. Address by Mr. E. Butterworth.

March 10.—MIDLAND JUNIOR ASSOCIATION.—Paper by Dr. F. S. Sinnatt, "A Consideration of the Properties of Coal Seams."

March 12.—WESTERN JUNIOR ASSOCIATION.—Meeting at Bristol. Paper by Mr. J. H. Bingham on "Dry Gas Meter Design."

March 16.—MIDLAND JUNIOR ASSOCIATION.—Visit to Watson House, London.

March 18.—SOUTHERN ASSOCIATION. — General Meeting, Hotel Metropole, Northumberland Avenue, W.C., at 2.30 p.m.

March 18.—LONDON AND SOUTHERN DISTRICT JUNIOR ASSOCIATION.—Lecture by Dr. R. Lessing, "Coal Constitution and Blending."

March 19.—SCOTTISH JUNIOR ASSOCIATION (WESTERN DISTRICT).—Visit to Coltness Iron Company's Cement Works, Newmains.

March 24.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS (EASTERN DISTRICT).—Meeting.

May 26.—SOCIETY OF BRITISH GAS INDUSTRIES.—General Meeting in London.

June 7-9.—INSTITUTION OF GAS ENGINEERS.—General Meeting in London.

EDITORIAL NOTES

Metropolitan Gas Companies' Reports and Accounts

Gas Light and Coke Company

THE results disclosed by the past year's accounts of our premier undertaking have fully justified the remarks of the Governor (Sir David Milne-Watson) at the last meeting, when he referred to the soundness of the Company's business and its excellent prospects. For the year has, indeed, marked another era of prosperity with further progress in sight during the current year. This is evidenced in the report, which states that the Bill providing for the transfer to the Company of the undertakings of the Southend-on-Sea and District Gas Company and the Brentwood Gas Company received the Royal Assent in July last, and the transfer of these Companies took effect on Jan. 1 this year. Also that the proprietors will be asked to approve a further Bill to authorize the extension of the Company's limits of supply to Canvey Island and for other purposes.

The sales of gas increased during the past year by 1½ p.ct., and have now reached the colossal figure of 245,226,830 therms. No change has been made in the price, which remains at 8⅗d. per therm in the main area of supply. The additions to the number of consumers were 27,027, and the number of gas stoves sold and let out on hire increased by 86,477. It cannot be too strongly emphasized that this progression has taken place during a year of extreme trade depression, and indicates that no effort has been spared to ensure for the Company's operations the utmost measure of success.

The capital account shows that, after allowing for depreciation, an amount of £1,071,389 has been expended during the year on additional lands, buildings, and machinery, district appliances, &c., making a total expenditure to date, less nominal additions, of £23,354,427. A further £41,895 of ordinary stock was redeemed during the year. As regards the revenue account, the total receipts amounted to £11,886,662, an increase of £50,770 over 1930. The revenue from gas yielded more by £77,587, and rentals increased by £46,984. On the other hand, the receipts from residuals declined by £82,493, due chiefly to a smaller yield from coke. A satisfactory feature is the decrease in total expenditure by £92,530, due mainly to savings on repairs to works and plant (£143,387) and in rents, rates, and taxes (£65,831). These savings, however, were partly offset by an increased expenditure on repairs and renewals of stoves (£69,023).

The net result is an increase in the gross profit of £143,299 to £1,953,228, which, together with the amount brought forward, &c., gives a total net revenue of £2,093,737. Interest charges amount to £591,631 and dividends on the preference and maximum dividend stocks to £262,788, while a further £40,000 has been transferred to the redemption fund. After providing for these and the dividend on the ordinary stock for the June half-year, there remains a balance of £668,633 available, out of which the Directors recommend a dividend on the ordinary stock for the December half-year of £2 16s. p.ct., making £5 12s. p.ct. for the year, the same as the two preceding years. This will absorb £529,512, leaving £139,121 to be carried forward, against £122,055.

A comparison of the working results with those of a year ago shows that the unaccounted-for gas has decreased from 4·03 p.ct. to 3·67 p.ct.; coke made for sale per ton of coal shows little variation at 9·91 cwt., against 10·10, while the percentage of coke used as fuel is slightly higher at 20·27. In common with its neighbours, the Company has had to pay more for its coal, the cost per ton being 21s., against 20s. 8d.; while the receipts from coke per ton decreased from 21s. 1d. to 20s. 9d. Tar realized more at 2·72d. per gallon as compared with 2·65d.

The costs per therm sold show a marked improvement on last year. The total expenditure, less residuals and the expenses in connection with the issue of debenture stock, works out at 7·81d. (against 7·97d.); gas and rentals, &c., realized 9·77d., and the gross profit is 1·96d. as against 1·82d. for 1930.

South Metropolitan Gas Company

NOTWITHSTANDING the almost unparalleled financial and trade vicissitudes of the past year, the report and accounts of the South Metropolitan Gas Company covering this period are very satisfactory. The soundness of the position is illustrated by a further addition to the number of consumers, now totalling 428,698, and by an increase in the output of gas of rather more than ¾ p.ct. Moreover, the gross revenue is more by £15,767 at £4,397,974, while the expenditure has decreased by £15,091 to £3,798,047.

The capital expended during the year on buildings, plant, machinery, and district appliances was £164,568, against £238,271 for 1930, a reduction of £73,703, while the credit side of the account has been reduced by £734,000 of 6½ p.ct. debenture stock which was redeemed at par in September last. The discount on this issue, amounting to £22,020, has also been provided for in the accounts.

Comparing the chief items in the revenue account, the increase in receipts is attributable for the most part to the larger income from gas and rentals amounting to £51,858. Against this, however, there has been a loss on residuals of £36,548. Coke and breeze realized less by £18,866. Tar receipts increased by £8026, but the proceeds from the sale of sulphate of ammonia have declined from £36,239 to £10,531, and the report states that at the present time the cost of manufacturing this bye-product exceeds the revenue obtainable.

The reduction in expenditure is due partly to savings effected on repairs to works and plant and to the fact that £44,532 appeared for non-recurring expenses in the 1930 accounts, while no transfer (against £40,000) has been made this year for special purposes. Coals, however, cost more by £70,029 on account of the extra quantity carbonized at a slightly higher price per ton—viz., 19s. 9·36d., against 19s. 5·49d. for 1930—and distribution charges cost more by £45,692, which is largely attributable to the heavier expenditure on repair and renewals of fittings.

The net result is an increase in the gross profit of £30,858 to £599,926. Adding thereto an amount of £2608 brought forward from the last account, interest credits, and the dividends on the South Suburban Gas and Commercial Gas stocks (£91,242), the total of the net revenue account is £693,776, against £617,904. The interest payable on loans, &c., debenture and preference stocks has increased from £195,927 to £267,676, and after allowing for this and the interim dividend of 2½ p.ct., *plus* the amount of £22,020 (referred to above) for discount on the 6½ p.ct. redeemable debenture stock, there remains a balance of £236,333 available, out of which it is proposed to pay a final dividend on the

ordinary stock of 3½ p.ct., leaving a small surplus on the year to be carried forward.

The working results, as illustrated by the following comparisons, have also been well maintained, and attention is drawn to the very low percentage of unaccounted-for gas:

	Year 1931.		Year 1930.
Coals carbonized (tons)	1,301,385	..	1,250,972
Therms made per ton	75·19	..	76·29
Gas unaccounted for p.ct. of make	0·36	..	0·88
Coke made for sale per ton of coal carbonized (cwt.)	9·30	..	9·66
Tar made for sale per ton of coal carbonized (galls.)	9·99	..	9·94
Liquor made for sale per ton of coal carbonized (galls.)	41·44	..	42·52
	s. d.		s. d.
Prices realized—			
Coke (per ton)	18 10·55	..	20 6·72
Breeze (per ton)	2 8·49	..	1 4·28
Tar (per gall.)	0 2·45	..	0 2·40
Ammonia (per butt)	0 5·06	..	1 5·66

Commercial Gas Company

THE accounts of the Commercial Gas Company for the past year are for the most part typical of many which the Company has presented in the past; and despite the financial and trade depression during the period under review it is satisfactory to record that the sales of gas show a small increase over the previous year. This has been accomplished, it must be remembered, in an entirely circumscribed area of supply which is largely given over to industry and inhabited almost wholly by a working-class community, so that any decline in trade is immediately reflected in the output of gas.

The accounts show that the capital account has been reduced by £5324, and the total capital expenditure per therm sold, less nominal additions, works out at 1s. 9·04d., against 1s. 9·18d. in 1930. The balance transferred from the revenue account is £137,195 (against £161,512), which, together with the balance of £48,837 brought forward, makes a total of £186,032. After providing for the payment of the dividend of 3 p.ct. on the ordinary stock for the June half-year and debenture and other interest, there remains a balance of £99,801, out of which it is proposed to pay a dividend of 2⅞ p.ct. for the December half-year, making 5⅞ p.ct. for the year, against 6 p.ct. for 1930.

The following comparison of the principal items of expenditure with the figures of the previous year shows that, with the exception of wear and tear, increases have had to be met under all heads. The heavy distribution costs can doubtless be attributed to extra maintenance and other schemes which are carried out for the benefit of the consumers.

	Year 1931. £		Year 1930. £		Increase or Decrease. £
Coals and oil cost	288,942	..	285,456	..	—
Residuals realized	208,323	..	209,755	..	—
Net coals and oil	80,619	..	75,701	..	+ 4,918
Wages carbonizing	36,112	..	35,494	..	+ 618
Purification	5,658	..	5,237	..	+ 421
Wear and tear	111,499	..	112,482	..	— 983
Distribution	210,473	..	196,383	..	+ 14,090
Rent, rates, and taxes	35,677	..	34,082	..	+ 1,595
Other expenditure	112,212	..	111,660	..	+ 552
Total net expenditure	592,250	..	571,039	..	+ 21,211

The working results have been fully maintained. It will be seen that the makes of gas and coke are slightly above those of last year, while the percentage of leakage is more than 1 p.ct. less. Coals cost more per ton by reason of higher contract prices, but the receipts from residuals have been very satisfactory. The following is a comparison with the figures for 1930:

	Year 1931.		Year 1930.
Coals carbonized (tons)	263,039	..	267,454
Cost per ton	21s. 11·48d.	..	21s. 2·89d.
Therms made per ton	73·89	..	73·20
Leakage, p.ct.	5·39	..	6·55
Coke made (cwt.)	11·09	..	10·95
,, realized per ton	22s. 4·69d.	..	22s. 4·79d.
Tar made (galls.)	9·91	..	9·51
,, realized per gallon	2·75d.	..	2·79d.
Ammonia (galls.)	39·90	..	40·87
,, realized per butt	2s. 3·11d.	..	2s. 6·92d.

Government Tariff Plans

THE outstanding event of last week was undoubtedly the outlining by the Chancellor of the Exchequer (Mr. Neville Chamberlain) of the tariff proposals of the Government. In various respects conditions have shown some brightening during the short interval which has elapsed since the present National Government came into power. There has been even, as Mr. Chamberlain pointed out, "a definite, if patchy, improvement in trade." But unemployment remains a vast problem; basic industries are still stagnant; taxation is at a devastating level; and an analysis of the trade balance shows that a credit balance of £100,000,000 in 1929 had become an adverse balance of £113,000,000 in 1931. These are the circumstances in which the Chancellor submitted to a packed House proposals which entail a momentous change in the fiscal policy of the country.

For long the question of Free Trade *v.* Protection has been discussed on the political platform, and generally by means of the same arguments. As world conditions changed, the objections raised to a tariff policy remained much the same, and one came up against a tendency to regard the matter as though the choice of Free Trade or Protection was still ours, irrespective of what the rest of the world might do. A self-satisfied frame of mind on this score is, however, no longer possible. Stripped of its robe of Party politics, the necessity for a tariff has been recognized by the National Government—or, perhaps one should say, by the majority of the Government. For actually the circumstances in which this far-reaching departure was heralded were unusual in the extreme, the Chancellor being followed by the Home Secretary (Sir Herbert Samuel), who voiced disapproval of proposals of the Cabinet of which he remains a member. This, of course, became possible owing to the "agreement to differ" scheme—seemingly in relation to our parliamentary system, an even more arresting innovation than is, in another direction, "the gentleman's agreement" which is said to have come into being between the income-tax collector and the victim of misfortune.

With regard to the scheme itself, it was explained by the Chancellor that the basis is a general tariff of 10 p.ct., modified by a short free list to include wheat, meat, fresh fish of British taking, raw cotton and wool, and tea. The 10 p.ct. duty is not to be added to existing duties; but ultimately there will be a superstructure of higher duties on luxuries or goods which could be produced in sufficient quantities at home. These will be imposed by Treasury Orders after consultation with an Advisory Committee consisting of a properly salaried Chairman and from two to five members, who will follow the general policy of restricting imports and safeguarding the consumer. At any rate pending the results of the Ottawa conference, neither the new general nor the new specific duties will apply to goods from the Dominions.

Legal Expenses and Income-Tax

READERS in the Irish Free State will have noted the case of *W. S. McGarry* (*Inspector of Taxes*) *v. Limerick Gas Committee*, which was reported in the "Irish Times." From this report it appears that the Special Commissioners had upheld the contention of the Gas Committee that the expenditure incurred in promoting a Bill (for the purpose of authorizing the Limerick Corporation to pay compensation by way of pension or allowance in certain cases to workmen and servants whose services had been dispensed with in consequence of the installation of modern plant and machinery in the gas-works) was a necessary trading charge to be debited against the income of the gas undertaking. The Inspector of Taxes maintained that the expenditure was of a capital nature, and, not being satisfied with the determination of the Commissioners, required a case to be stated for the opinion of the High Court. Mr. Justice Hanna has now

delivered judgment in favour of the Gas Committee, dismissing the appeal with costs against the Revenue Authorities.

The ruling is not, unfortunately, a legal precedent in this country, and is, indeed, at variance with the prevailing views of the Somerset House Authorities. Their attitude is, generally speaking, that, where statutory powers are invoked, this must be regarded as bringing into existence an asset for the enduring benefit of the business, although it must be evident that such proposals as were included in the Limerick Bill could not possibly increase the profit-earning capacity of the undertaking. The only asset would be the increased goodwill of the officials and employees. This attitude is based on a decision of the Scottish Court of Session (*Moore & Co. v. Hare*, 1914), that the expenses of promoting a Bill in Parliament—the Bill being subsequently withdrawn after the objects thereby aimed at had been otherwise achieved—were in the nature of capital expenditure, and not deductible from profits for the purposes of arriving at the income. This view was still further upheld as a result of the more recent case of *Knight* (*H.M. Inspector of Taxes*) *v. Wirksworth Gas Light and Coke Company, Ltd.*, 1926, in which the King's Bench Divisional Court reversed the decision of the Special Commissioners (who had found in favour of the Company). This case affords, however, little assistance in determining the position as regards the allowance of legal costs, for the reason that the case was not fully argued before the High Court, and the Company did not adduce any evidence to enable the Court to disallow the appeal of the Inspector of Taxes.

Now that an Irish undertaking has been successful in removing the doubts, which must have long existed, as to the legality of the present practice, it may be hoped that the time is not far distant when our own authorities may be persuaded to allow, in appropriate cases, the deduction of legal and parliamentary expenses in connection with the promotion of Private Acts and Special Orders under the Gas Regulation Act, 1920.

PERSONAL

PRESENTATION TO MR. FRANK PRENTICE.

Just over 50 years ago Mr. Frank Prentice entered the service of the Ipswich Gas Light Company; a few days ago he was the recipient of two presents on his retirement from the office of Engineer and Manager. But his services will still be at the disposal of the Company, for, as our readers are aware, he has accepted a seat on the Board of Directors.

It was in August, 1881, that Mr. Prentice commenced his service with the Company as Chemist, under Mr. Ebenezer Goddard, whose son, Mr. D. Ford Goddard (afterwards Sir Daniel Ford Goddard) was the Assistant Secretary and Engineer. On the death of his father in 1882, Mr. Ford Goddard assumed the chief position, with Mr. Prentice as assistant. Five years later, when Mr. Goddard relinquished industry for politics, Mr. Prentice continued as Works Manager under the new Engineer, Mr. J. T. Joliffe, varying his duties for a time as District Superintendent. On the retirement of Mr. Joliffe, in 1914, owing to the great growth of the undertaking, the duties of the chief officer were divided, and Mr. Prentice was appointed Engineer and Manager, with Mr. G. A. Mallett as Secretary.

The scene of the presentation was the Works Hall, which was not large enough for the number of workers and ex-workers who were able to attend. The chair was occupied by the Chairman of the Company, Mr. Henry Woodall, who was supported by Mr. Philip Cobbold, the Vice-Chairman; Mr. A. J. Haward, one of the Directors; and the heads of the various departments.

In opening the proceedings, the Chairman said that Mr. Prentice had been the friend of all present, and, though there was a certain element of sadness on that occasion, it was quite eclipsed by the happiness and gratitude they all felt in the fact that they had had devoted to their service practically the whole of Mr. Prentice's working life. He would not embarrass Mr. Prentice by a recital of his services to the Company, but would only say that no Company could have had a more able, honourable, and faithful servant than he had been.

Mr. Woodall then asked Mr. Prentice to accept a silver salver from the Directors, which bore the inscription: "Presented to Mr. Frank Prentice by the Directors of the Ipswich Gas Light Company, on the occasion of his retirement as Engineer and Manager, in recognition of their high appreciation of his loyal, able, and faithful service of 50 years."

Mr. G. A. Mallett, the Secretary of the Company, presented Mr. Prentice with a wireless set, from the workmen and staff, as a memento of pleasant and strenuous times together.

Mr. Prentice, returning thanks, after referring in high terms to the ability and assistance rendered by their Chairman, who occupied a distinguished place in the Gas Industry, said that from the staff he had always received loyal service, but after all the real backbone of any company was the men who were employed by it. He had always considered the men of the Company to be his friends, and if he had been able to help them at any time he had always been willing to do so, and he hoped that state of things would continue.

MR. REGINALD P. CHESTER.

Mr. Reginald Percy Chester, the Governing Director of Messrs. Donald Macpherson & Co., Ltd., of Manchester and London, completed 21 years' connection with the Company on Feb. 6, during the last eight years of which he has held the position of Governing Director. As a mark of appreciation of his consideration for the welfare of all concerned, he was the recipient of an illuminated address signed by his Co-Directors and every employee in the Company, congratulating him on the success of the Company under his guidance.

Mr. Chester is the second son of the late Mr. Chester, of Nottingham, who was a Past-President of the Gas Institute. Mr. Percy Chester was brought into the Company by his uncle, the late Managing Director, Mr. S. W. Tamplin.

Mr. Chester is a keen golfer and has won many trophies in various competitions, including two in connection with the members of the Society of British Gas Industries. He is a good all-round sportsman, as well as a sound business man, and into whatever he undertakes he puts his whole energy, which inspires all who have to work with him. This has largely contributed to the success of the Company.

Mr. WM. C. CAMPBELL, Junior Assistant at Falkirk Corporation Gas-Works, has been appointed Assistant Manager at Helensburgh Corporation Gas-Works. Mr. Campbell is 24 years of age.

Mr. S. MCLEAN, lately Director of Messrs. Daniel Adamson & Co., Ltd., has joined the staff of Messrs. Hick, Hargreaves, & Co., Ltd., and will take charge of their turbine, turbo-compressor, turbo-blower, and rotary compressor sales.

Mr. HAROLD E. BLOOR, Engineer, Manager, and Secretary to the York Gas Company, was last week appointed to the local Executive Committee in connection with the visit to York by the British Association for the Advancement of Science next autumn.

OBITUARY

The death occurred on Feb. 5 of Mr. E. C. HOLT, of the Gas Light and Coke Company, at the age of 56 years. Mr. Holt joined the Company in 1896, and served in the Gas Sales Department, rising through the various grades until reaching the post of Divisional Inspector. In August, 1918, his services were lent to the Board of Trade in order that he might take charge of certain work with the Coal Mines Department connected with the "Household Fuel and Lighting Order." This post he held until the termination of the work in February, 1919. Upon the retirement of Mr. W. F. Fagan in 1922, Mr. Holt was appointed Manager of the Haggerston Stove Works, which post he held until his death.

Mr. GEORGE CHRISP, of Hill View, Penycae, Port Talbot, Bye-Products Manager at the Margam Works of Messrs. Baldwins, Ltd., died on Feb. 1, aged 53. He was widely known for his work as an industrial chemist, and was an expert on fuel technology. He was a member of the Institute of Engineers and a Past-President of the Coke Oven Managers' Association.

CORRESPONDENCE

Intermittent Vertical Chambers—Bottom Gas Offtakes

SIR,—If your correspondent Mr. A. H. Lymn will turn still further into the back issues of the "JOURNAL" he will find illustrated and described, on page 442, Feb. 15, 1910, the bottom gas offtakes, British Patent 1484/1909, as actually applied on the British system of "Elland" intermittent verticals at Cleethorpes, erected by the firm of Robert Dempster & Sons, Ltd., Elland, 23 years ago.

Therefore, while appreciating sympathetically the motives prompting your correspondent's letter, I think he, too, will realize that same fellow-feeling.

H. J. TOOGOOD,
Robert Dempster & Sons, Ltd.

Rose Mount Iron Works,
Elland,
Feb. 5, 1932.

Coke in the Open Firegrate

SIR,—Mr. Dyde, in his article on "Coke in its Relation to Domestic Use" in your issue of Jan. 20, is surely too sweeping in his statement that graded gas coke can only be burned in barless grates by maintaining an inordinately large fire. I have used nothing but screened vertical coke on the 12-in. and 16-in. barless grates in my house for nearly three years.

The secret of successful working lies in starting with a fairly large fire to heat the grate, allowing this to burn down to the required level, and in always maintaining a convex top to the fuel bed, with a slight downward dip at the back of the grate. The small flickering flame produced by a fuel bed of this shape, although it undoubtedly reduces the proportion of radiant heat, greatly improves the appearance of the fire, and has been found to be a great help in persuading other consumers to try vertical coke.

The weekly consumption of coke on a 16-in. grate in which the fire burns from 8 a.m. to 11 p.m. seven days a week has averaged 1½ cwt. during the past few weeks. This can hardly be called excessive. The cinders left in the grate are screened, and burnt in the fire on the following day.

R. B. TUNSTALL.

105, *Northumberland Park,*
Tottenham, N. 17,
Feb. 4, 1932.

Gas Installation on a Yacht Barge

SIR,—I do not know if this is unique, but it may be of interest to some of your numerous readers to learn that the yacht barge "Mamgu," owned by Mr. R. V. E. de B. Crawshay, and at present berthed at the Hythe Quay on the River Blackwater, Maldon, Essex, has a supply of gas laid on for the purpose of lighting, heating, and hot water supply, and it was my privilege to be shown over this craft by the owner and his wife, who use it as their permanent residence. Needless to say, the boat is beautifully fitted with every modern home comfort, and is capable of sleeping 14 persons with ease.

Mr. Crawshay is a keen enthusiast of gas, and at his request the Maldon Gas Company were approached with a view to arranging for gas to be installed throughout the boat, and for the fixing of 6 lighting points, 8 heating points for stoves, a gas copper, which provides hot water in the bathroom, and a gas ring installed in the kitchen. The supply has been connected from the service pipe to the boat by means of a length of flexible steel tube, which, in turn, is connected to the iron pipe leading to the meter inlet; the supplies from the meter outlet have all been run in compo pipe, and a very neat job has been made of it. The whole of the living rooms and cabins are centrally heated by means of an anthracite stove installed in the lounge.

Mr. Crawshay's one regret is that when cruising gas is not available, and it is then necessary to revert to electricity, which is also installed throughout. I am, however, at the moment endeavouring to ascertain where gas filled cylinders, at a reasonable price, can be obtained to enable the owner to carry gas during the time he is cruising. Perhaps some of your readers can enlighten me on this point.

E. W. BONSEY.

Gas-Works, Southtown,
Great Yarmouth.
Feb. 3, 1932.

Technical Development of Gas Fires

SIR,—It is a pleasure to acknowledge the response of Herr J. Körting ("JOURNAL" for Jan. 27) to my query of Dec. 2 last as to whether air can be warmed to a moderate degree without impairing the radiant efficiency of a gas fire. I extend to him thanks for his most helpful contribution, in which I am sure I am joined by all who desire to see the economic performance of the gas fire raised—within the bounds of acceptable hygiene.

Herr Körting says "German manufacturers have tried for the last ten years to increase the efficiency of a radiating gas fire by means of additional heating surface." Can the same be said of British manufacturers? The question is not put hypercritically, but solely as an inquiry for information. A lot of research proceeds in the technical laboratories of the manufacturers which is not blazoned "from the house tops," and it may be that they have been just as active as their German confrères in the matter of harnessing to usefulness air warmed in appliances designed for domestic room heating. But glancing through the "JOURNAL'S" review (Feb. 18, 1931) of the miscellaneous exhibits at the British Industries Fair, 1931, I see neither reference to nor illustration of a fire which substitutes for the canopy needful to evacuate products of combustion a superimposed chamber which adds to this function that of warming air for room heating. Will greater fortune attend the 1932 Fair, and the "JOURNAL" be able to record in its corresponding review number this year a definite advance in this direction? In this connection it is as well to record that the trend of design has been to larger canopies for evacuating purposes, by which means a modicum of air is heated while passing over the canopy surface externally.

It does not surprise me that the first constructions of the German manufacturers with a surface heater added to the radiating fire were unsatisfactory through the loss of draught ensuing on persevering with a series of superimposed pipes. Although Herr Körting does not say so, probably another adverse effect was a reduction in radiant efficiency, though that would be negligible compared with what would have obtained had the air heating pipes been behind, and not above, the radiants. It may be recalled that in the radiation tests in my paper at the Institution meeting held at Dublin in 1907, a fire with hollow tubes at the back gave high duty for heated air, but a radiant duty of not more than 40 p.ct. of what would be considered a satisfactory figure at that time. When the hollow tubes were taken away, a firebrick back substituted, and the depth of fuel reduced (radiants were then unknown except the type used in the "Kern" radiator), the index of radiation was increased from 44 to 92. One of the important conclusions then reached was that air heating tubes or chambers at the back of a fire greatly reduce radiation, and another that a thin body of fuel is essential to a high radiant efficiency.

Other professional obligations long ago translated me from investigator of gas heating problems to the less exacting, though scarcely less interesting, rôle of observer. Yet I have kept enthusiasm for gas heating aflame by closely scanning all technical developments. In the light of it I see no reason to doubt that figs. 2 and 3 which Herr Körting supplies mark an advance in the required direction, and that the gas fire he describes is absolutely reliable, completely evacuates flue products, and does not impair radiation as compared with ordinary radiant fires. It would have been helpful if he could have given us some idea of the percentage of supplementary useful heat which he ascribes to the air heating hood—*i.e.*, the heat of the gas divided (approximately) into (*a*) radiant energy, (*b*) heat of convection, and (*c*) flue heat.

It would be easier to form an opinion on the æsthetic (suitability of design) side if one saw the actual appliance fixed in a fireplace. On the information given, and the "look" of fig. 3, it does seem that the right combination of utility and suitability has been reached. The design appears more like the article needed than anything that has yet appeared. It should be a comparatively easy matter to blend it with "surround" so that the whole would be harmonious, and not offensive to the artistic sense.

We have, of course, plenty of gas radiators in which by luminous flames or otherwise a small percentage of heat is afforded as radiant energy, but these can never hope to oust the traditional method of heating living rooms. The Seranne gas-heated radiator, which was presented to the last annual meeting of the Association Technique de l'Industrie du Gaz en France, is a sort of half-way house, the design combining refractory bars fixed underneath

strips of transparent mica with a recuperation chamber through which flue gases travel, and by which air passing over the chamber externally is heated. But the heater does not seem to lend itself to being accepted as a rival for the radiant gas fires as we know them. It is claimed for the Seranne heater that it has an efficiency of from 75 to 78 p.ct., but I have seen no statement of how much of this is ascribed to true radiant energy and to heat imparted to air respectively. The German gas fire can hardly reach the efficiency of the Seranne heater, for in the first the temperature of the gases entering the chimney is 356° Fahr. with vertical and 446° Fahr. with inclined radiants, and in the second about 170° Fahr.

Herr Körting truly says that "The most surprising factor for the British gas engineer will probably be the radiants leaning forward top foremost." In addition to the normal upright formation we have radiants leaning backward, and also radiants in concave and in convex formation. But our German friends are first in setting radiants with the top leaning forward. We have Herr Körting's assurance that the radiant efficiency of the forward lean is "not less than usual." Yet the effect cannot be precisely the same. The more we think about radiant formation the more is the conclusion forced that an investigation and report which would put the subject in complete scientific focus would be worth while, and might save designers from a lot of misdirected energy. Such work would not improperly interfere with initiative and originality by makers, which none of us would willingly discourage.

Enough has been said to indicate that there is plenty of scope for further endeavour in the matter of gas fire design. We ought to be able to get up to an efficiency of, say, 75 to 80 p.ct. as a regular thing in the appliances offered for room heating, at least in houses not yet constructed, where design and fitment are not crippled by circumstances beyond the control of gas undertakings. In the case of existing houses development is more circumscribed; but even here the quest for an appliance which will incorporate a measure of air heating, with acceptability, and harmony with existing surrounds (or such as can be substituted at permissible expense) seems far from hopeless. Herr Körting has shown the goal as visibly nearer, and I shall look with considerable confidence to seeing British makers emulate and even outstrip their German friends.

JNO. HY. BREARLEY.

Wharmton, Harrogate,
Feb. 4, 1932.

Radiation plus Convection

SIR,—Herr J. Körting's letter in your issue of Jan. 27 certainly raises an extremely interesting question, and one, moreover, which is never far from the thoughts of every manufacturer of gas fires. We remember the original "Askania" fire, which, by means of a series of vertical tubes, gave an amount of convected heat which was found to be about 10 p.ct. of the actual heat input. This was a very considerable achievement, and the only drawbacks to its success were, as Herr Körting points out, its inability to carry all its products into the flue, and (on British Standards) its somewhat bulky appearance.

We cannot say that we entirely agree with the principles on which Herr Körting has constructed his later model. We are all aware that by reducing the dilution of products *in the radiant—i.e.*, by restricting the access of secondary air to the flame—a considerable increase of radiant efficiency can be obtained. In our laboratories we have recently made extensive tests of two types of radiants, one of which presents an unattractive appearance and produces bad combustion, whereas the other (one of the recently introduced "brighter" fuels) gives remarkably good combustion and has a most pleasing appearance. The radiant efficiency of the "brighter" fuel is, however, definitely lower than that of its less attractive predecessor. In judging the merits of a gas appliance it is well to remember that the salesman's point of view is as valuable as that of the technician.

The figure of 6 p.ct. CO_2 in the products leaving the radiants is of a very high order, and the production of CO at this high concentration cannot but be considerable. The harmful effect produced by a slight escape of products (due to down-draught) would, of course, be proportional to the amount of CO present in the flue gases.

We are not sure that we quite understand Herr Körting's figures relating to ventilation. If the fire on a laboratory bench, not connected to a chimney, produces an air movement of 300 c.ft. per hour when 30 c.ft. per hour of gas are being burnt, one would say that the self-ventilating properties of the fire are considerable. But when attached to a chimney the same apparatus would be called on to pass an air-flow of 3000 to 4000 c.ft. per hour. This would tend to nullify the usefulness of the fire as a means of obtaining convected heat. We notice, however, that a damper is provided for regulating the flow of diluted products to the flue. The advisability of fitting such a device is questionable.

The most provocative feature of Herr Körting's fire is, as he himself admits, the forward inclination of the radiants. To this we naturally take exception. The reasons for tilting the radiants forward are solely that the dilution of the flame shall be reduced. The advantages of such a feature we have already questioned. The disadvantages are obvious. The distribution of heat from the fire is affected in a most undesirable way, the effective height of the fire aperture is severely reduced, there is positive danger of damage by fire from the possibility of a broken radiant falling forward on to the hearth, and the work of fitting new radiants would be a matter for an expert mechanic. We have endeavoured in recent years, with a great measure of success, to demonstrate that the ideal fire is one in which the radiants slope backwards at an angle of 20° to the vertical. This construction gives a better distribution of radiant heat from the fire, prevents all possibility of broken fuel falling on to the hearth, and eliminates the unsightly fuel guard.

Herr Körting is under the difficulty, natural to all makers of gas fires, of not wishing to give actual figures of radiant efficiencies. There is at present a good deal of confusion due to varying claims as to the efficiency of different kinds of fires. It is recognized that no form of curved-fuel fire, or of any fire that endeavours to imitate a glowing coal fire, has an efficiency equal to that of the best fires using properly designed columnar radiants, but apart from this one particular few details of any importance are known to the Gas Industry as a whole. It would be of advantage to all concerned if some independent authority, such as the Research Sub-Committee at Leeds, or the Research Department of the Gas Light and Coke Company, were to publish figures representative of various types of fires, expressed as the ratio of heat radiated to gross heat supplied. We suggest "gross" heat particularly, as the consumer buys heat on that basis, and efficiencies given on net calorific value are misleading.

RESEARCH DEPARTMENT,
Cannon Iron Foundries, Ltd.

Deepfields, near Bilston,
Feb. 2, 1932.

The Dry Gas Meter—Suggestions on Policy

SIR,—It is somewhat refreshing to look through the "JOURNAL" and find a report of such an excellent paper as that placed by Mr. S. R. Preston (Adelaide) before the Australian Gas Institute; and through the medium of your columns, I should like to express my congratulations on a paper bearing upon a subject, which, despite its profound effect upon the finances of the Gas Industry, figures so little in the minds and activities of gas engineers in this country.

No doubt the paper will have greater value and force in the country of its origin, owing to the difference of climatic and other considerations; in particular, the matter relating to the new type of wet meter, for we are mainly concerned with dry meters, and present opinion will no doubt require very strong reasons to revert to the fluid type.

Interest, therefore, mainly centres upon the first part of the paper relating to dry meters and their vagaries, although the experience with "oil filming" will not be lost upon those who have wet meters upon the district. Comment is severely restricted in the absence of material details, such as age and pattern of meter referred to, capacity per hour and per revolution, &c., for it must be observed that during the past year or two marked progress has been made here with dry meters in relation to design, assembly, lubrication, reduction of pressure loss, and increased throughput, which it is hoped will diminish the severity of the troubles which have in a greater or lesser degree been the experience of all gas undertakings for some time past.

There are certain details concerning registration and life upon the district, which, having their counterpart in this country, may serve to stimulate the Institution of Gas Engineers to give closer attention to gas meters in the future, as regards both production and service.

The writer feels somewhat intrigued as to the circumstances which have led Mr. Preston to the conclusion that the test of a meter, brought in from the district, has little practical value. I presume the reason for this is the failure of many such tests to square up with the assumption of what the readings should have been, as the inference of previous readings over a similar period both

before and after would appear to indicate. In my view, there should be no difficulty in obtaining reliable test results, but such results will not be obtained by any perfunctory test as generally applied to the ordinary run of new or newly-repaired meters. The tests will have to be of sufficient duration to obtain stable results and at varying speeds up to the badged capacity. Where in certain circumstances it may be deemed desirable to exceed the nominal capacity, it would have no force from the official point of view.

In the case of a master meter and several check meters, one would immediately agree with Mr. Preston that it is a "fruitful source of trouble," for whereas the error of the individual check meter may be negligible, the aggregate error may be one of some concern. Careful assembly and valve timing, together with extended testing until stable resultant errors are noted and corrected for as far as possible, will do much to reduce the discrepancy to practical proportions, always providing that the speed of the meters and the possible temperature differences due to situation are taken into account.

The general run of both official and works tests is subjected to the limitations of time, cost, and general expediency, though it is no secret that in the case of new dry meters there is a tendency towards faster registration due to running-in. In making some provision to deal with this, it is the practice of the writer to subject all meters that on a short test exceed 1 p.ct. fast and 3 p.ct. slow to extended tests before stamping or rejecting. All high-capacity meters are checked at two or more speeds, the same applying to other types excepting the smaller domestic meters, which, of course, predominate.

It is observed in the table given that a period of twelve months on the district has been responsible for a throughput reduction of approximately 18 p.ct. The writer ventures the opinion that the comparisons would have greater value expressed in terms of increased pressure loss for a given throughput, or, alternatively, a reduced throughput for a given pressure loss. Generally speaking, a certain reduction of volume would be anticipated, although it does not always follow, and a similar table for a group of wet meters over the same period would have been interesting. In the latest types of dry meter here, taking the smaller meters for example, the delivery for a pressure loss of 5-tenths exceeds the badged capacity by 200 p.ct. or more, thus allowing not only for reduction in volume due to working conditions, but for additional appliances which may be connected up without the knowledge of the department, without undue strain upon the meter.

Digressing from the material points of this paper, the writer would like to add one or two items bearing upon ultimate economy, efficiency, and expediency. The Institution of Gas Engineers having given so much time and thought to rationalization and standardization in connection with works plant, carbonizing methods, and gas consuming appliances, it seems somewhat strange that so far as is generally known so little attention should have been paid to the subject of meters. The writer, therefore, with the greatest deference, would make bold to suggest that the following items might profitably be considered:

(1) That consideration be given to a scheme to provide for the minimum number of capacity sizes that present-day distribution experience would dictate as being necessary. This would eliminate many existing ratings which have no practical difference from others in their immediate group. It would facilitate records and eventually reduce the cost of repairs, and would assist in reducing the floating stock necessary. For the meter manufacturers it would mean a reduction of dies, templates, parts, and stock, which would be reflected in the initial cost of production. It would certainly simplify matters for outdoor staff.

(2) That existing size designations should be abandoned, and that meters be badged and referred to by their hourly capacity.

(3) That meters should be required to comply with certain minimum provisions of throughput capacity and pressure loss—*i.e.*, a minimum percentage overload between the pressure loss at the badged capacity and the maximum pressure loss permissible under the Act. This would secure a uniform minimum efficiency and prevent over-rating. It would place no restriction upon a meter manufacturer striving to obtain a trade advantage by reason of greater efficiency or improved design. It would protect the gas engineer and convey definite information to the distribution staff, whereas at the present time the disparity between patterns and different makers must lead to confusion with consequent over and under running as the case may be.

WM. TEMPLETON,
Chief Inspector.

Gas Meter Testing Station,
Gower Street, Leeds,
Feb. 8, 1932.

Naphthalene in Gas

SIR,—It is reported in the "JOURNAL" for Feb. 3, p. 262, in the discussion on "The Problem of Naphthalene Removal" by Mr. B. Thorpe, that "Mr. Berglin continued by saying that certain investigations undertaken in a gasworks in Australia, with which he had been associated, showed . . ."

As this reads it would appear that I had been employed by the Australian Gas Light Company. Such is not the case, as I was connected with the Brisbane Gas Company. The information I gave was that given me last August by the Chief Chemist to the first-mentioned Company, when I visited their Mortlake Works on my way to England. My statement embodied his experiences and those of his assistants in the estimation of naphthalene.

It is fitting that in the same issue of the "JOURNAL," Mr. A. E. Bradshaw, of the Metropolitan Gas Company, Melbourne, should pay tribute to the readiness with which the staff of the Australian Gas Light Company make known the information they gather during their investigations. It is in order to give the credit where it is due that I point out that the ethylene glycol method for the estimation of naphthalene in town gas was devised by the technical staff of this Company.

C. L. W. BERGLIN.

71, *Clarendon Road,*
Leeds,
Feb. 4, 1932.

IN CONTINENTAL COUNTRIES - - -

Abstract Translations from the Technical Press of France and Germany.

DETERMINATION OF THE DEGREE OF COALIFICATION OF COALS BY MICROSCOPIC METHODS.

E. Hoffmann and A. Jenkner in "Glückauf," 1932, 68, 81-88 (Jan. 23), describe new methods designed to give information as to the degree of coalification of coals. The different petrographic constituents of coal vary in their coking properties according to the degree of coalification; hence a knowledge of the latter is of importance.

It was found that the reflective power of the surface of coal as measured with the Beker slit microphotometer made by Leitz increases with increase in the degree of coalification—*e.g.*, from 7 p.ct. in the case of a low-rank bituminous coal to 13 p.ct. or more in the case of an anthracite. So far, the test, which is a very quick one, is only applicable to polished surfaces of the lump coal though it may prove possible to adapt the instrument for use with preparations of powdered coal embedded in a matrix and relief-polished. Coals from a number of different countries have been examined and were found to fall into proper sequence as regards the relation between their geological rank and reflecting power.

A further indication is obtained by the examination of a relief-polished preparation of embedded powdered coal with incident polarized light and rotation of the polarizer. Coal shows a degree of anisotropism which varies with the extent of coalification. The use of polarized light also provides useful information as regards the durain, since, in the case of highly transformed durain, the plant cuticles are rendered visible, whereas this is not the case with ordinary light.

THE NEWS OF THE WEEK

The Ulster Home Ministry has approved of the building of a showroom at the municipal gas-works, Lurgan, the probable cost of which will reach £3000.

The Filey Urban District Council has instructed the Surveyor to make inquiries into, and report upon, the possibilities of making effective use of gas for decorative strip lighting and flood lighting in the Crescent Pleasure Gardens on the sea front.

About Three Hundred Guests were present at the Annual Whist Drive and Dance of the staff of the South Shields Gas Company, held in the Hedworth Assembly Rooms, South Shields. Prizes were presented to successful whist players by Mrs. R. F. Harbottle.

Price Reduction at Leatherhead.—The Directors of the Leatherhead Gas and Lighting Company announce that as from the reading of the indices of the meters at the Lady-Day Quarter, 1932, the price of gas to ordinary consumers will be reduced by three-fifths of a penny per therm, which is equal to nearly 3d. per 1000 c.ft.

Newcastle-upon-Tyne Dividends.—The Directors of the Newcastle-upon-Tyne and Gateshead Gas Company have resolved to recommend to the proprietors, subject to audit, the payment of final dividends for the year ended Dec. 31, 1931, as follows:—2 p.ct., less income-tax, upon the preference stock, making 4 p.ct. for the year; £2 17s. 6d. p.ct., less income-tax, upon the ordinary stock, making £5 7s. 6d. for the year.

The Smethwick Gas Committee have considered the adoption of a scheme for the supply of "Lynton" water heaters for the use of consumers and have decided that such heaters be supplied to consumers at the following charges, including fixing: Simple hire—10s. per annum, or with prepayment meters, 2d. per week for summer quarters, and 3d. per week for winter quarters. Hire-purchase—£4 10s. 9d. by 12 quarterly payments. Purchase—£4 2s. 6d.

A Visit Was Paid last week by Gas Managers from Buckhaven and Leven, Alloa, Bathgate, Prestonpans, Kinross, Galashiels, Kilmarnock, and Hawick to North Berwick Gas-Works, when they were shown over the recently installed plant for concentrating gas liquor by Mr. R. J. Philp, Engineer and Manager. The plant has automatic control. The company was entertained, after the inspection, at luncheon, when Provost G. Eeles presided. The Gas Committee Convener told the company that a saving had already been effected although the plant had only recently been brought into service.

Announcement is Made of the publication of the Proceedings of the Third International Conference on Bituminous Coal, which was held under the auspices of the Carnegie Institute of Technology, Pittsburgh, in November, 1931. The proceedings, printed in two volumes of approximately 900 pages each, include all papers and discussions delivered at the four-day meeting. Contributions of scientists from Belgium, France, Germany, Holland, Italy, Japan, Roumania, Spain, Sweden, and the U.S.S.R. have been translated into English. Illustrations and graphs have been incorporated in the books. The price per set of two volumes is $15.00 postage prepaid.

Low-Temperature Central Heating is a growing factor in warming the private house, especially the large house where many rooms are used only occasionally, but must be kept free from damp. (Such houses of course often have gas fires in some of the rooms—for instance sitting rooms and nurseries.) For halls and staircases central heating is particularly useful. Gas undertakings during the last few years have put in a very large number of gas-fired central heating installations—and the number is growing rapidly. In relation to this system, the important point is that gas can be so perfectly controlled by automatic means that the radiators are never overheated, and the air never becomes uncomfortably dry. The latest issue (No. 214) of "A Thousand-and-One Uses for Gas" is the first of three numbers of this publication to deal with central heating by gas. It describes installations in private houses, a block of flats, a nurses' hostel, and a large block of offices.

After Considering a Report on the comparative costs for lighting by electricity and gas the four street signs for one-way traffic, including the erection and maintenance of the signs by the respective Departments, the Southport Watch Committee decided that the signs be lighted by gas and that the electricity standards already obtained be returned to the makers. Also that the Chief Constable be authorized to obtain four standards for street signs for one-way traffic suitable for lighting by gas.

Institution of Gas Engineers.

Members of the Institution are invited to attend the second meeting of the Engineers' German Circle (Deutscher Ingenieursirkel), which will be held at the Institution of Mechanical Engineers on Monday, Feb. 29, at 6 p.m.

Herr Oberingenieur Carl Derschow, Hon. Technical Adviser to the Leipzig International Industries Fair, will read a paper entitled "Leistungen der deutschen Technik, 1931" (German Technical Accomplishments in 1931), which will be illustrated with lantern slides.

Hand painted reproductions on oak shields, measuring 8 in. by 6½ in., of the Arms of the Institution of Gas Engineers (excluding the crest, supporters, and motto), as approved by the Council, can be obtained (by members of the Institution only) from Messrs. A. W. Crisp & Co., Heraldic Artists, 16, King's Parade, Cambridge, price 12s. 6d. each, including packing and postage.

In ordering, members should indicate the class of membership of the Institution to which they belong, and enclose the necessary remittance.

British Commercial Gas Association.

The Annual Meeting of the members in Scotland of the British Commercial Gas Association was held on Friday, Jan. 29, in the Central Station Hotel, Glasgow. Councillor CATTO, Aberdeen, was called to the chair and was accompanied at the head of the table by Sir Francis Goodenough, Chairman of the B.C.G.A.; Mr. J. W. Napier, Alloa; and Mr. J. C. Walker, Secretary of the B.C.G.A. The following gentlemen were unanimously re-elected members of the General Committee representing Scotland: Messrs. R. W. Cowie (Hawick), A. Dow (Galashiels), D. Fulton (Helensburgh), George Keillor (Greenock), J. W. McLusky (Glasgow), and J. W. Napier (Alloa). Sympathetic reference was made by the Chairman to the recent death of Mr. A. C. Young (Arbroath), who, it was stated, had been for 40 years associated with the Gas Industry.

It was explained that arrangements were being made for celebrating the centenary of gas production in Dumbarton in October of the present year, and the meeting approved of the idea of holding a district conference at Dumbarton under the auspices of the B.C.G.A. about the same time. The feeling of those present was that both functions might be happily combined, and it was left to the Executive to make the necessary arrangements.

Sir FRANCIS GOODENOUGH thereafter addressed the meeting at considerable length on matters affecting the policy and work of the Association and its members. The subjects dealt with by him comprised: (*a*) National, district, and local publicity; (*b*) sales management—policies and methods; (*c*) scheme of education and training for gas salesmen; and (*d*) lectures and lecturers. At the outset, Sir Francis made sympathetic reference to the absence of Mr. Mason through illness. He said the Association at the present time was spending a sum of £50,000 annually on national and district publicity, but it was his firm conviction that the Industry could spend considerably more a year on that form of propaganda with essential profit to itself. It did seem to him that they were not spending nearly enough in that way in relation to the size of the Industry. In the course of his reference to the scheme for the education and training of gas salesmen, Sir Francis said he regarded it as singular that, while between 1400 and 1500 salesmen had enrolled for the course of study which

had been prepared especially for their benefit, not one had come forward from the Scottish side of the border. That was astonishing in view of the fact that already undertakings which had encouraged their staffs to take the course were reporting marked results in a variety of directions. Indeed, the general verdict of principals was that the money expended in this way for the education and training of salesmen had justified itself as a sound investment.

Following an interesting discussion the meeting terminated with votes of thanks to the Chairman and Sir Francis.

Gas and Electricity Costs for Manchester School Lighting.

Details of greater expenditure on electricity for lighting purposes than on gas were given during a meeting of the Manchester City Council recently.

The Special Expenditure Committee had reported that some of the increased costs of education was due to the change over from gas for lighting and other purposes to electricity, and Alderman Walker, of the Electricity Committee, asked that the matter should form the basis of a meeting between members of the Electricity Committee and the Expenditure Committee to remove what he described as a " misapprehension."

Alderman Swales, Chairman of the Special Expenditure Committee, pointed out that in the statement given by the Education Committee to the Expenditure Committee of the cost of lighting, &c., by gas in 1914-15, the cost of gas was £24,263, equal to 5s. per head of average attendance. In 1931-32 the cost was £28,950, equal to 6s. per head, and they were told that this was due to the change-over to electricity.

At Brookland School in 1926 the cost for lighting by gas, &c., was £32 7s. 3d. In 1930 it was lighted by electricity, and the cost was £100 3s. 3d., or 200 p.ct. increase. The Bishop Bilsborough Memorial School in 1928 was lit by gas at a cost of £8 6s. 2d. By electricity in 1930 it was costing £22 6s. 1d., an increase of 169 p.ct.

Councillor Johnson, a member of the Expenditure Committee, said that the policy of the Electricity Committee had cost the city hundreds of thousands of pounds. The cost of lighting a public road by electricity was £546 and by gas £231.

It was decided to adopt the minutes of the Electricity Committee with the exception of the proposal that the Committee should confer with the Expenditure Committee on the matter.

Do It at Dundee.

Dundee has been extolled for its " Jute, Jam, and Journalism "—although its jam is really marmalade. The city has unique claims as a manufacturing centre for distribution at very low cost to the dense consuming areas of Scotland and North Britain, and it is determined that its light—in the form of splendid facilities for the development of industries, excellent sites, fine buildings available for adaptation to modern manufacturing, together with its low rates, skilled labour, cheap gas, electricity, fuel, water, and transport—shall not remain under a bushel.

In a most attractively bound and beautifully illustrated book entitled " Do it at Dundee," the City Development Committee invite leaders of industry to regard Dundee as a possible venue for their developing activities. Though much is in their minds about the proud history and traditions of their City, yet little is said of that in this book. Their aim is to give an objective presentation of such facts as are vital to the decisions of those who either bear the responsibility of establishing new industries, or seek new ground for the development of existing industries.

An Efficient Gas Undertaking.

Early in the book attention is given to the all-important question of Power, and under this heading a tribute is paid to the efficient gas production in the City. Nearly 2000 million c.ft. of gas, it is stated, was made in 1930, and the Gas Undertaking showed a useful surplus on its operations. The increased use of gas for industrial purposes is made possible by the co-operation of the Gas Engineer, and special rates are quoted where substantial quantities are required. The present rate is a basic charge of 2s. 11d. per 1000 c.ft., subject to reduction according to quantity varying from 2½ p.ct. by sliding scale to 25 p.ct., *plus* a further fixed period cash discount of 5 p.ct. The tendency is for the rate to go down. It is also mentioned that a high-grade of gas coke is produced.

Reference is made, in addition, to the activities of the tar distillation works, where creosote oil, tar, pitch, &c., are produced. Among a series of excellent photographs of the City, an aerial view of the Victoria Docks takes in the gas-works in the middle background.

A delightful frontispiece in colour of an old-fashioned galleon in full canvas sailing towards the setting sun and the binding of the book, which is actually in Dundee jute, add dignity to the production.

Low-Temperature Carbonization at Sheffield.

Commendatore Salerni has given an assurance at Sheffield that the plant for his patent process for the low-temperature carbonization of coal would be made in Sheffield.

With regard to the question of the site, he promised to convey to Sir Eric Hambro, who is financing the scheme, the representations made to him. These were conveyed to him at a meeting at the Town Hall, and Commendatore Salerni seemed to be impressed by the arguments put forward that Sheffield was the most suitable place at which to develop the process.

Barrow Gas Supply.

At the Barrow Town Council monthly meeting on Monday night, Feb. 1, Councillor Holland moved the adoption of the minutes of the Gas and Water Committee.

These stated that in reply to a letter from the Clerk to the Ulverston Rural District Council asking the Corporation to consider the advisability of extending their gas service along the coast road to Roosebeck it was decided that the Clerk to the Council be informed that the Corporation were unable to furnish a gas supply as they had no gas mains in the vicinity and the cost of laying them from Roose would be prohibitive.

The Manager reported that he had been approached by the Borough Engineer and Surveyor with regard to improving the Street Lighting generally by the substitution of a three and four cluster burner for the present single light; that he had submitted a scheme to him which would cost this Department between £250 and £300; and that he had agreed to pay an extra 1s. per annum on the total number of lamps in the area. The action of the Manager was confirmed.

Compressed Gas Driven Buses: Experiments in Rotherham.

At a recent meeting of the Rotherham Corporation Gas Committee the Engineer referred to the question of the use of gas stored in high-pressure cylinders instead of petrol for driving motor cars, and asked for instructions with regard to the carrying out of an experiment in conjunction with the Transport Manager on two buses belonging to the Transport Department.

It was mentioned that this experiment would entail an expenditure of approximately £500 by the Gas Department for the necessary compressing and storage plant. The Committee recommended that, subject to the Engineer being satisfied on investigation that such an expenditure is necessary, he be authorized to proceed with the proposal.

The Transport Manager submitted the proposal for an experiment in operating buses by gas instead of petrol to the Transport Committee, and the Chairman reported that the Gas Committee had already considered the matter and authorized expenditure for experiments. The Committee recommended that the Transport Manager be authorized, together with the Gas Engineer and Dr. C. M. Walter, of the Birmingham Research Laboratories, to confer with representatives of the Ministry of Transport on the question.

A Flourishing Benefit Society.

Founded in 1875, the Newport (Mon.) Gas-Works Benefit Society now has 180 members, and a 5d. weekly contribution provides substantial benefits. Fifty years ago the members' contributions were £45; last year they were £168. In 1879 there was no reserve fund; now it totals £586. Since its establishment the Society have paid out £6359, while their Royal Gwent Hospital contributions totalled £2050.

There were 120 present at the King's Head Hotel for one of the Society's most successful dinners on Feb. 1.

The Chairman, Mr. J. H. Canning, President of the Institution of Gas Engineers, proposed " H.M. Sea, Land and

THE NEWS—*continued.*

Air Forces," to which Colonel W. Clifford Phillips responded.

Alderman C. F. Williams, a Director, replied to "The Chairman and Directors," proposed by Mr. H. D. Madden, Engineer and Manager to the Cardiff Gas Light and Coke Company.

Research work in the Gas Industry was referred to by Mr. Madden when he pointed out how splendidly the Industry held its own. Salesmanship by every gas workman was essential. Gas fitters must be commercial agents for their Company.

Tributes were paid the chief company officials and Directors for their interest and practical help in the Society.

There were few towns with better amenities and health facilities than Newport, remarked Councillor Clissitt. It was wrong that the Gas Company had to subsidize, through rates, their competitors; it was unfair competition.

The Society Officials present included Messrs. H. Crayford, Vice-Chairman, and A. H. Trigg, Secretary. Mr. Tom White, who accompanied Mr. Canning recently on an American visit, was one of the guests.

The Chairman conveyed an expression of regret for absence from his brother, Mr. T. F. Canning, and his son, Mr. T. A. Canning.

Cheaper Coke for Ulverston.

At the Ulverston Urban District Council meeting, on Tuesday, Feb. 2, the Gas Committee recommended that the price of coke be reduced by 2s. 6d. per ton as from Feb. 1 with a graduated scale in favour of large consumers. An amendment that the minute be referred back to see whether the price could not be further reduced was defeated by the casting vote of the Chairman.

During the discussion, Councillor Warhurst, Chairman of the Gas and Water Committee, pointed out that the reduction meant bringing the price down to 22s. 6d. per ton, with a graduated scale in favour of merchants and large consumers down to 19s. 6d. per ton. He said that this was a very reasonable price considering the quality of the coke, which was not made from slack but from best coal costing 23s. 6d. per ton, and if they further reduced the price they would be reducing their gas-works' profits.

Failure of North Country Petrol Refinery.

Col. W. A. Bristow, Chairman of Petroleum Refineries, Ltd., of Killingholme, on the Humber, and of Colwick (Notts.), attributes the Company's failure to the fact that so much petrol was brought from abroad at much less than the cost of production that it was impossible to carry on the business at a profit.

According to the Official Receiver's report, the selling price of the Company's potential output was reduced by nearly £400,000 per annum from the time it was formed until the cessation of operations at the refinery.

According to the statement of affairs filed in the liquidation the gross liabilities amount to £134,245, of which £58,775 are treated as expected to rank. The assets are estimated at £74,728 but are all absorbed in the payment of preferential claims and part payment of those of the debenture holders. A total deficiency of £499,775 is disclosed with regard to the shareholders.

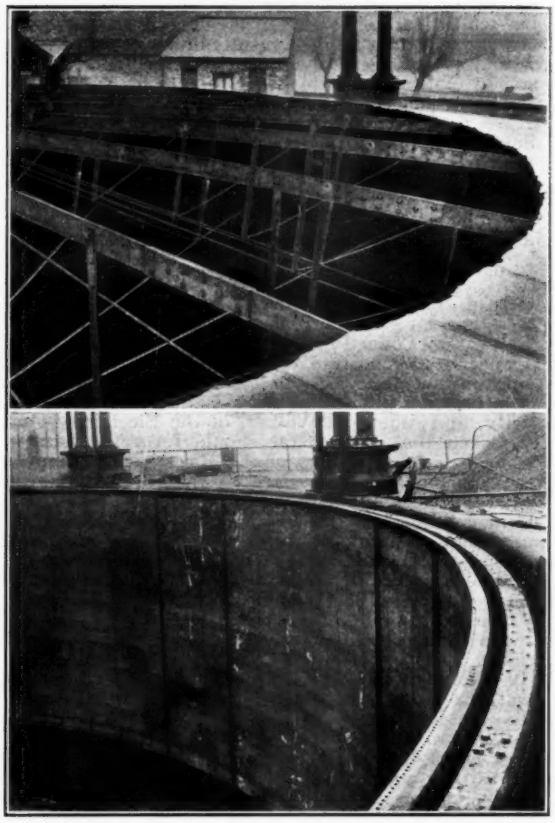
The Official Receiver adds that the Company was registered as a public company in February, 1929, with a nominal capital of £470,000. Its chief object was to acquire from the Gyro Process Company, of Detroit, U.S.A., a licence to produce motor spirit from petroleum oils. The original Chairman was Sir Arthur Grey Hazlerigg, Bart., but he resigned on Jan. 1, 1931, when Col. Bristow was appointed in his place. The issued capital is £441,000, and there are 2881 ordinary and 3718 preference shareholders.

A balance-sheet, prepared as at May 27 last, disclosed that the cost of the plant and machinery at Killingholme exceeded by £90,000 the prospectus estimate. The whole of the shares offered in the prospectus had been taken up by the public, but the foreshadowed profits did not materialize. The total estimate of profits amounted to £246,000, but for the period of eleven months during which refining operations were in progress a gross trading loss of £69,539 was incurred.

In May last receivers were appointed on behalf of debenture holders, and the refinery and oil storage depôt have been sold for £55,000 by tender. The realizations of the stocks of petrol and oil and of the book debts have resulted in a net sum of approximately £17,000. There is consequently no prospect of any surplus becoming available for the unsecured creditors, and there can be no return of capital to the shareholders.

The Official Receiver is the liquidator.

The Virtues of Puddled Iron.



These photographs show the condition of the metal in two gasholders recently dismantled by the York Gas Company. The top view is of a holder erected in 1869, *while the holder depicted in the lower photograph was built in* 1857. *All the sections are perfectly clean. There is no sign of corrosion, and the metal looks exactly as though newly erected.*

Commercial Gas Company.

Results in 1931.

The revenue account shows a profit for the year of £137,194 13s. 2d., which, together with the balance of £48,837 5s. 6d. brought forward from the previous year, makes a total of £186,031 18s. 8d. After providing for the payment of the dividend for the June half-year at the rate of 3 p.ct., less income-tax, on the ordinary stock and for debenture and other interest there remains a balance of £99,801 3s. 11d., out of which the Directors recommend the payment of a dividend for the December half-year at the rate of 2½ p.ct., less income-tax, making a total for the year of 5½ p.ct., less income-tax.

South Suburban Gas Company.

Results of 1931 Working.

Compared with the previous year, the sales of gas show an increase of nearly 5½ p.ct., mainly attained during the first six months. In the second half of the year the consumption fell off owing partly to the abnormally mild weather and partly to other adverse conditions. The additional consumers number 7545.

The Directors recommend payment for the second half of the year of a dividend of 3 p.ct. on the 5 p.ct. ordinary stock, less income-tax, making the dividend for the year 6½ p.ct., and leaving the sum of £233 0s. 9d. to be carried forward to next account.

Agreements have been entered into with the Sevenoaks Gas Company and the Tonbridge Gas Company for the acquisition of those Undertakings.

SPIRAL GASHOLDERS

By S. M. MILBOURNE, A.M.I.Struct.E.

A brief treatise investigating from a mathematical standpoint, as far as possible, the main loads and stresses induced in the various members which constitute the spiral guided gasholder. The determination of the actual sections required safely to withstand these loads is then a matter of arithmetical computation and practical experience in design

(*Continued from p. 252.*)

When the lifts of the gasholder are fully inflated there is also the action of the hanging weight on the cup and dip rings to be considered and this may be investigated as follows: Fig. 10 illustrates a cup and dip ring in section. The weight (W) hanging on the dip is indicated in its line of action distance, *a*, from the outside edge of the dip channel.

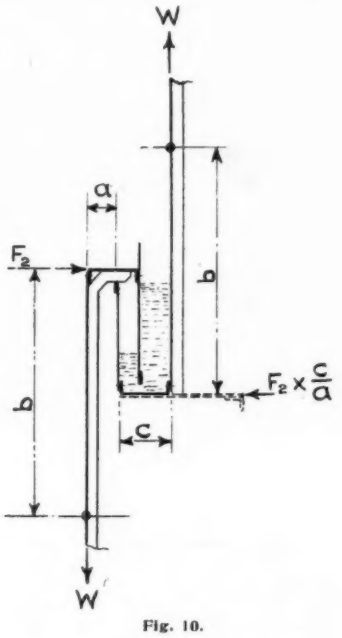


Fig. 10.

To maintain the dip in equilibrium under the moment Wa it is necessary to apply the force F_2. Since the dip ring is circular this force is provided by the tensile resistance of the material forming the dip. It is somewhat difficult to ascertain the exact position of the fulcrum below the dip channel about which the force F_2 operates, as much is dependent upon the stiffness of the vertical stays, number of guide rails, &c. However, if this distance is taken at about twice the depth of the cup skirting plate, the results obtained will be sufficiently accurate for practical purposes.

If W = the weight of the hanging lifts per unit of circumference, and F_2 = the equivalent horizontal force per unit of circumference, it will be seen that as $Wa = F_2 b$, the equation giving the tension T on the dip ring is:

$$T = \frac{DWa}{2b} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \quad (17)$$

The resulting stress in the dip ring may then be stated as follows:

$$\frac{T}{A_2} = \frac{DWa}{2A_2 b} = \frac{W_o a}{2\pi A_2 b}$$

where A_2 = the equivalent sectional area of the dip ring,
W_o = the weight of the hanging lifts.

As the stress developed in the dip ring is not evenly distributed over the cross sectional area of the material, but is greatest at the outer edges of the dip channel, it is reasonable to assume that the maximum stress $\left(\frac{T}{A_2}\right)$ reaches about π times the value given. The above equation may therefore be written:

$$f_b = \frac{W_o a}{2A_2 b} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \quad (18)$$

where f_b = the maximum tensile stress developed in the dip ring on the axes XX and YY due to weights of the hanging lifts.

The maximum stress in the cup ring is dealt with in a similar manner to the dip ring, but as the vertical load due to the weight of the lifts is transmitted to the cup plate, the leverage will be increased to Wc. The resulting stress in the cup ring is compressive and reaches its maximum value on the inner edge of the cup channel. Assuming the same condition of stress distribution as for the dip ring, the maximum compressive stress in the cup ring may be stated thus:

$$f_c = \frac{W_o c}{2A_3 b} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \quad (19)$$

where f_c = the maximum compressive stress in the cup ring on the axes XX and YY due to the weights of the hanging lifts,
A_3 = the equivalent sectional area of the cup ring.

The allowable stresses f_b and f_c determined from equations (18) and (19) are usually kept low, as it is not only a matter of strength of the cup and dip rings, but their resistance to flexure that requires consideration. There is also a small eccentricity of loading on the cup ring due to the overturning moment of the wind and snow for which some allowance should be made.

The shearing load of the wind on the inflated holder increases at a constant rate from zero at the top curb to its maximum value at the tank balcony. On referring to the manner in which the wind load is apportioned to the rings and is resisted by them, it will be seen that the total shearing load operating in the plane of any ring will be equal to the sum of the local wind load on the ring and the wind load values on the upper rings. The shearing stresses which are resisted tangentially at each ring are transmitted through the side sheeting and framing of each lift to the lower rings without altering the character or relative position of the tangential forces to any appreciable extent. The effect on the cup and dip due to the transmission of these tangential forces is to set up a compressive stress in the cup and dip rings, and this will now be considered.

If $[x_1]$ represents the tangential system of forces due to the total shearing load on any particular ring, then the maximum value x_1 obtaining on the axis YY may be expressed similarly to equation (12) as follows:

$$x_1 = \frac{2P_2}{n_1} \qquad \ldots\ldots\ldots\ldots\ldots\ldots \quad (20)$$

where n_1 = the number of square panels contained round the circumference of the lift $= \pi D/d$. (The nearest even number is taken.)
P_2 = the total shearing load of the wind acting on the ring.

On the 1st lift cup ring $P_2 = 3P_1/2$
,, 2nd ,, ,, $P_2 = 5P_1/2$
,, 3rd ,, ,, $P_2 = 7P_1/2$
,, bottom curb ,, $P_2 = NP_1 = P$
,, tank balcony ,, $P_2 = (2N + 1)\,P_1/2$

See fig. 7.

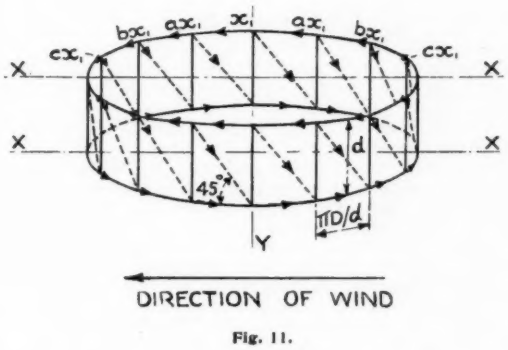


Fig. 11.

Fig. 11 indicates diagrammatically a lift of a spiral holder the upper ring of which is subject to a tangential force system $[x_1]$. The values x_1, ax_1, bx_1, &c., are shown

in this case operating at the nodal points formed by the square panels. The vertical stays have not been indicated in their respective positions, but are assumed massed together at the nodal points on the cup rings in order that the stresses in the frame may be estimated more easily. As the greatest resistance is developed in the panels adjacent to the axis YY the maximum compressive stress in the cup and dip rings may be found as follows:

$$f_7 = \frac{x_1}{A_1} \quad \ldots \quad (21)$$

where f_7 = the compressive stress in the cup and dip ring on the axis YY.

The stress in the cup and dip rings of the inflated lifts due to the internal gas pressure p_1 is given approximately by the expression

$$f_8 = \frac{2dr p_1}{3A_1} \quad \ldots \quad (22)$$

where f_8 = the tensile stress in the cup and dip ring on the axes XX and YY.

Figs. 12 (*a*) and (*b*) indicate the manner in which the various stresses in the cup and dip rings may be summed on the principal axes of the holder.

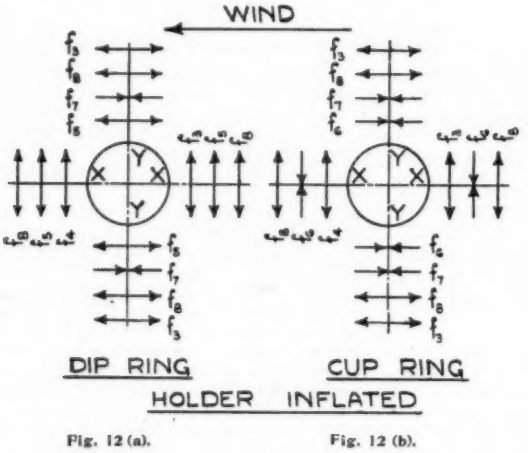


Fig. 12 (a). Fig. 12 (b).

In order to increase their strength and rigidity the cups are sometimes stiffened by means of a horizontal ring formed of plates and angles secured to the cup channels as shown by dotted lines in fig. 10. This method of construction not only reduces the stress in the cup plates, but also increases the radius of gyration of the cup section.

The stresses in the side sheeting of a spiral holder are of importance, and these will now be investigated.

Referring to fig. 11, it will be seen that the force system $[x_1]$ is resisted by a series of forces operating diagonally across the panels of each lift. As the direction of these forces is at 45° with the horizontal, it follows that the maximum horizontal stress in the side sheeting of any lift due to the total shearing load of the wind acting on the upper ring of the lift may be ascertained from the equation:

$$f_9 = \frac{x_1}{dt} \quad \ldots \quad (23)$$

where f_9 = the maximum tensile stress in the side sheeting of the lift on the axis YY.

In determining the equivalent stress, the joint efficiency should be taken into account in the usual manner.

Although the influence of the wind on the full depth of the side sheeting of each lift has been allowed for when calculating the stresses in the cup and dip rings, there is no doubt that some tension is set up in the sides of a lift between these rings due to the suction of the wind. This approaches its maximum value on the leeward side and its minimum value on the windward side of the holder on the axis XX. The amount of tension due to wind is difficult to estimate, as much depends upon the number and section of the guide rails and vertical stays, also the ratio of depth to diameter of the lift. By calculating the reactions (Q_5 and Q_6) on the axis XX due to the normal pressure of the wind only on the side of a lift, it will be found that these bear the following relationship to the local wind load P_1. $Q_5 = \cdot 3P_1$ and $Q_6 = \cdot 44P_1$ for the windward and leeward sides of the lift, respectively. If the side of the lift is assumed to resist a maximum stress equivalent to three-quarters of this load acting over the sectional area *dt*. then the stress due to the primary action of the wind may be stated thus:

$$f_{10} = \frac{3}{4}\left(\frac{\cdot 3P_1}{dt}\right) = \frac{\cdot 23P_1}{dt} \quad \ldots \quad (24)$$

$$f_{11} = \frac{3}{4}\left(\frac{\cdot 44P_1}{dt}\right) = \frac{\cdot 33P_1}{dt} \quad \ldots \quad (25)$$

where f_{10} and f_{11} = the tensile stress in the sheeting of any particular lift on the windward and leeward side of the holder, respectively, normally to the axis XX.

Taking similar moments about the axis YY it may be shown that the tensional stress (f_{12}) in the side sheeting on this axis is given approximately as follows:

$$f_{12} = \frac{3}{4}\left(\frac{\cdot 4P_1}{dt}\right) = \frac{\cdot 3P_1}{dt} \quad \ldots \quad (26)$$

The assumption that three-quarters of the bursting load due to the suction of the wind on a lift is resisted by a section of material equal to *dt* is well on the side of safety, particularly in the case of the outer lifts where the guide rails and vertical stays are placed comparatively close together.

There is, however, another condition of stress in the side sheeting to be investigated before the most unfavourable condition of tension can be determined. Suppose the gasholder to be partially inflated, so that a portion of one of the lifts remains submerged in the tank. In this case the total shearing load of the wind on the floating portion of the structure is transmitted to the balcony ring, but this is not resisted directly by tangential forces as in the case of the inflated lifts that are cupped. Tilting of the holder in the plane of the tank balcony takes place about the axis YY until the guide rails are brought in contact with the roller carriages. But since the guides are free to move tangentially, a secondary tilting action occurs about the axis XX, until the movement of the floating holder is checked by radial forces set up in line with the roller axles on the dips of the stationary lifts. If the outer lift is cupped the radial pull and thrust are transmitted directly to the balcony carriage axles. This system of radial forces operating on the floating lift in the plane of the tank balcony is indicated as $[x_2]$ in fig. 13.

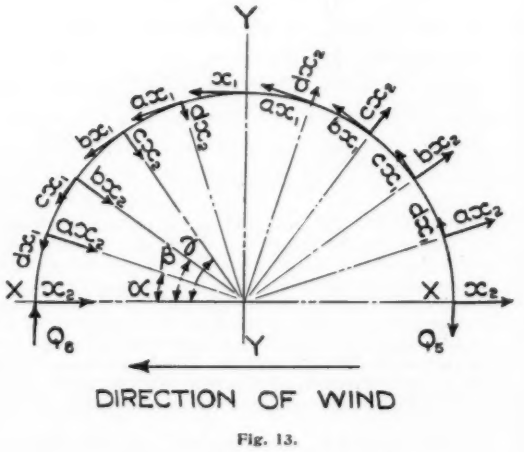


Fig. 13.

On referring to fig. 8 it will be seen that the radial displacements OO'' for any points on the circumference of the ring vary in accordance with the sines of the angles (α, β, &c.) subtending them from the axis YY. Therefore the expression representing the radial forces $[x_2]$ about the axis XX may be written as follows:

$$P_3 = 2x_2 + 4ax_2\cos\alpha + 4bx_2\cos\beta + \quad \ldots \quad (27)$$

where P_3 = total load of wind on the exposed portion of the floating holder,
a, b, c, &c. = proportionate displacement fractions.

Reducing the above expression, which is numerically identical to equation (11), and equating for the maximum value x_2, then

$$x_2 = \frac{2P_3}{n_2} \quad \ldots \quad (28)$$

where n_2 = the number of guides on the lift of the holder.

The values of ax_2, bx_2, &c., are ascertained in the usual manner from $x_2\cos\alpha$, $x_2\cos\beta$, &c., respectively. The reactions Q_5 and Q_6 for the combined force systems $[x_1]$ and $[x_2]$ on the axis XX for the windward and leeward sides of the holder. are determined from the principle of

moments as follows (since the reaction $Q_5 = Q_6$ in magnitude, but is of opposite sign):

$$f_{13} = f_{14} = \frac{Q_5}{Kdt} = \frac{\cdot 21P_3}{\cdot 5dt} = \frac{\cdot 42P_3}{dt} \quad \ldots\ldots \quad (29)$$

where f_{13} = the tensile stress induced in the sides of the lift on the windward side of the holder on axis XX,

f_{14} = the compressive stress induced in the side of the lift on the leeward side of the holder on axis XX,

K = a constant indicating the proportional depth of the lift (d) over which the loading systems are distributed, taken as 0·5 for usual proportions of construction when the lift is half inflated.

The overturning moment of the wind and snow load on the inflated lifts is resisted by a system of forces set up in the roller axles in the plane of the tank balcony. If the guide rails on the floating lift are arranged in a dextrorsal direction, the overturning moment will tend to force the spiral guides down on the left-hand roller of each carriage on the leeward side of the structure, while the guides on the windward side will tend to bear upwards on the right-hand rollers. The guides are arranged at an angle of 45° with the horizontal, and it follows that any upward or downward pressure on the axles may be resolved into its horizontal component. Fig. 14 illustrates a two-roller carriage under the downward action of the guide rail.

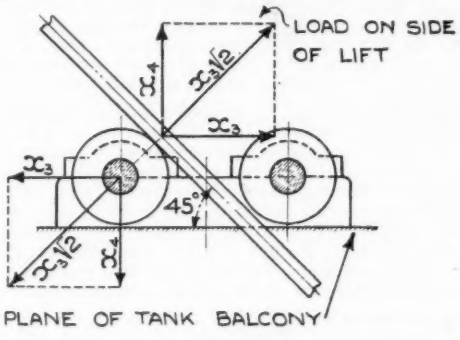


Fig. 14.

The horizontal and vertical forces are indicated by the vectors x_3 and x_4. The maximum load on the axles is therefore $x_3 \sqrt{2}$. As this load is transmitted to the rollers, it follows that the side sheeting and framing of the lifts are subject to equal and opposite forces which may now be investigated. It will be observed that as the holder tends to tilt under the influence of the wind and snow loads the guide rails will transmit the load to the rollers in varying proportions, dependent upon their relative distances from the neutral axis YY. Fig. 15 (elevation) represents a spiral holder with two lifts inflated, under the action of wind and snow moments (M and m). The vertical resisting force system $[x_4]$ operating in the plane of the tank balcony is also indicated. The magnitude of these vertical forces in the sides of the partly submerged lift may be estimated by considering the holder as an elastically stiff structure capable of transmitting stresses to the roller axles directly proportional to the relative deflection displacements (as shown graphically in fig. 15).

The force system $[x_4]$ may then be expressed trigonometrically about the axis XX as follows:

$$2rx_4 + 4r\cos\alpha\, ax_4 + 4r\cos\beta\, bx_4 + \ldots\ldots$$

(where a, b, &c. = fractions of unity relative to the displacements—see fig. 15).

This expression may be reduced to

$$4rx_4(\cdot 5 + \cos^2\alpha + \cos^2\beta + \cos^2\gamma + \ldots\ldots)$$

Writing the above expression in tangent form and equating this to the wind and snow moments, the following is obtained:

$$\frac{x_4 r n_2}{2} = \frac{P_3 N d}{2} + \cdot 424rS \quad \ldots\ldots\ldots \quad (30)$$

From this the maximum value x_4 may be obtained, and since $x_3 = x_4$ the force systems $[x_3]$ and $[x_4]$ are identical in magnitude. The equation may then be written after further reduction—

$$x_3 = x_4 = \frac{1\cdot 14N^2\rho d^2 + \cdot 848S}{n_2} \quad \ldots\ldots\ldots \quad (31)$$

By equating for n_2 and introducing the safe vertical load on the roller carriage in place of x_4, the number of guides required on each lift may be ascertained.

The values of ax_3, bx_3, ax_4, bx_4, &c., may be obtained from $x_3 \cos\alpha$, $x_3 \cos\beta$, $x_3 \cos\gamma$, &c. The horizontal force system x_3 is shown in fig. 15 (plan).

Now it will be seen that under the action of force system $[x_3]$ the floating holder will tend to move in the direction indicated by arrow (fig. 15, plan). This movement is prevented, however, by a system of radial forces $[x_5]$ acting along the axles of the carriage rollers. These forces are similar to those previously described, which transmit the shearing load of the wind to the tank balcony, and the trigonometrical expressions are identical. In this case, however, the expression is equated to the overturning moment (M + m) instead of the shearing load of the wind. Since the force system $[x_5]$ is numerically equal to the

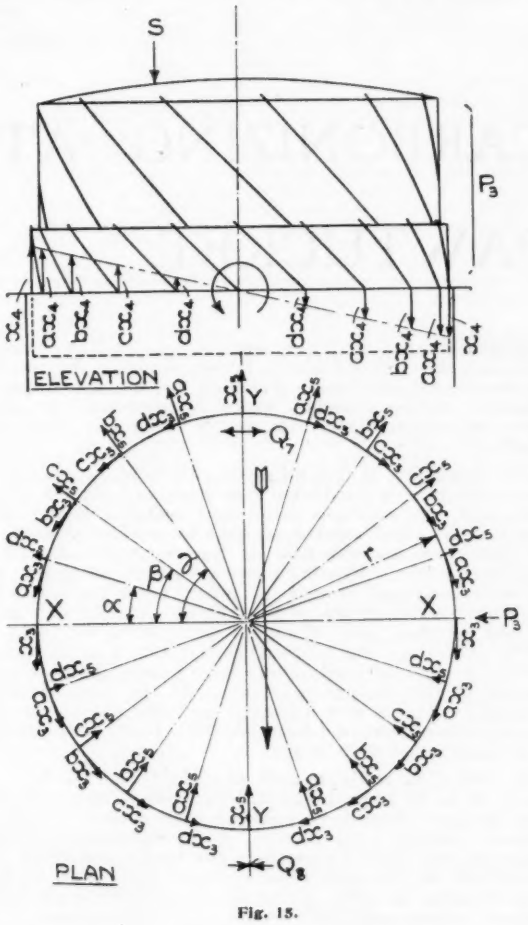


Fig. 15.

force system $[x_3]$, it may be shown that $x_5 = x_4$, $ax_5 = ax_4$, $bx_5 = bx_4$, &c. On referring to fig. 15 (plan) it will be observed that the maximum tensile and compressive loads in the side of the floating lift due to the secondary action of the overturning moments of wind and snow will be reached on the axis YY diametrically opposed to the wind. In order to find the maximum stress in the sides of the floating lift, the force systems $[x_5]$ and $[x_5]$ are resolved into directions perpendicular to the axis YY, and their moments are considered in a similar manner to those of the force systems $[x_1]$ and $[x_2]$. The resulting reactions Q_7 and Q_8 will be found equal in magnitude, but of opposite sign, as the values of Q_7 and Q_8 are dependent upon the value x_5 or x_5, and on that account are identical with the relationship between Q_5, Q_6, and x_2. The magnitudes of Q_7 and Q_8 may be stated as ratio, $x_2/Q_5 = x_5/Q_7$. Equating for Q_7 and Q_8, then

$$Q_7 = Q_8 = \frac{x_5 Q_5}{x_2} \quad \ldots\ldots\ldots\ldots \quad (32)$$

The stresses induced in the sides of the lift may be derived in a similar manner to equation (29) as follows:

$$f_{15} = f_{16} = \frac{Q_7}{Kdt} = \frac{x_5 Q_5}{Kdtx_2}$$

Therefore the equation becomes in terms of P_3, x_2 and x_5

$$f_{15} = f_{16} = \frac{\cdot 42x_5 P_3}{dtx_2} \quad \ldots\ldots\ldots\ldots \quad (33)$$

where f_{15} = the tensile stress induced in the sides of the floating lift on the axis YY at 90° with direction of wind,

f_{16} = the compressive stress induced in the sides of the floating lift on the axis YY at 270° with direction of wind.

When the floating holder has developed the force systems $[x_3]$ and $[x_5]$ it will be observed that the tangential force system $[x_3]$ operating at each point on the side of the floating lift will tend to increase the tensional stress in the side sheeting on one side of the guide rail, while on the other side of the rail a compressive load will be induced. The resulting stresses in the side sheeting are, however, fairly evenly distributed over the full depth of side sheeting on account of the stiffness of the spiral plates and vertical stays. The stress, which may be taken as either tensile or compressive (depending upon which is the most unfavourable condition), will be represented by the equation—

$$f_{17} = \frac{x_3}{2dt} \quad \ldots \ldots \ldots \ldots \ldots \quad (34)$$

where f_{17} = the tensile or compressive stress induced in the side sheeting on the windward and leeward side of the lift on the axis XX.

(To be continued.)

CARBONIZING AT PAWTUCKET - -

An Example of Speedy Erection and Satisfactory Working of Glover-West Verticals

Pawtucket is one of the oldest towns in New England and is in the State of Rhode Island, which is the smallest of the forty-eight states. Founded in 1671, the staple industry is cotton spinning, which is augmented by many other industries, chiefly iron, textile machinery, and allied trades.

The Stone and Webster Engineering Corporation are the engineers for the Pawtucket Gas Company, and it was in 1915 that the coal gas plant was installed under their supervision. This was the second Glover-West plant in the United States and the first in that country to have four retorts in a line. Heating gases are passed along one side of the retorts and around the other, enter the waste gas flue at the producer side of the setting. This original plant of four settings, each of eight retorts 33 in. by 10 in. by 20 ft. 10 in. long, was reconstructed in 1924 with the double burner system of heating in which waste gases left the setting at the non-producer side. At the same time improved producers were installed and the daily output of the plant was increased from 900,000 c.ft. to 1,300,000 c.ft. —an increase of over 40 p.ct.

In 1927, two settings, each of eight " New Model " retorts, 40 in. by 10 in. by 25 ft. long, were added, and these two settings alone were credited with a daily output of almost 1,300,000 c.ft. In 1930, after very careful consideration, it was decided to replace the four old settings with three new ones of eight retorts each of the " New Model " type installed in 1927. These three settings are giving excellent service and fully reach the expectations of the Company, with a daily output of 3,300,000 c.ft. and up to 3,700,000 c.ft.

In order to have the plant in readiness for the heavy winter load, the time taken for the work was the essence of the contract. The four old settings and steelwork were demolished and replaced by three new ones, and gas-making commenced, all between April 1, 1930, when the first man arrived on the plant, and Aug. 25, 1930, when gas was passed into the mains—one day short of twenty-one weeks. The last man, inclusive of operators, left the plant on Sept. 17, only twenty-four weeks and one day after the first man arrived.

During the Spring of 1932, it is intended to re-set the sixteen retorts built in 1927, and this work will be completed —cessation of gas-making to re-starting of gas-making—in exactly eight weeks.

Operation of Handling Plant.

Coal is brought to the plant by water and is unloaded into a hopper or into storage by the grab of an unloading bridge. It passes from the hopper through a crusher to a belt, and from this belt to an old 20 in. belt conveyor. From this conveyor it passes to a series of new 24 in. belts, the first being inclined and the second horizontal, from which it goes either to a belt over the coal bunkers in the retort house or to the water-gas plant.

Coke is discharged from retorts to a 24 in. belt conveyor which carries it up an incline to a tower and then on another 24 in. belt to the screening house, where it passes over a vibrating screen and reciprocating screens into coke storage bins in readiness for discharge to vehicles. This conveyor system also carries coke to the water-gas plant. At each outlet gate of the storage bins there is a stationary screen which ensures clean coke going to consumers. At this point the coke is sprayed with a calcium chloride solution in order that the dust nuisance in consumers' cellars may be reduced to a minimum.

An interesting feature of the coke handling plant is that coke is discharged directly from the retorts to a 24 in. belt which is rubber coated. This conveyor is constructed on what is known as the Duplex system, and consists of a driving belt on the top of which is the carrying belt. This system eliminates the necessity of having such a heavy carrying belt, thus minimizing the cost of renewals. There are two head pulleys and two tail pulleys, the driving belt extremes being on the inner two pulleys and the carrying belt extremes on the outer two pulleys.

Another interesting feature of the plant is the air blowers to the producers. These are driven by turbines, the exhaust steam from which is mixed with the air which goes into the producers. The use of these blowers allows small fuel to be gasified and releases a corresponding additional quantity of large-size coke for sale. Doors are fitted to the producers and a static pressure, varying according to conditions, of 1½/10 in. to 3/10 in. of water presure is maintained in front of the grates. Producer gas quality is carefully watched and the speed of the turbine controlled to give best results and conditions. This speed usually varies between 700 and 900 r.p.m. In order to be assured that there is a sufficiency of producer gas, a pressure of 3/100 in. to 4/100 in. of water is maintained at the second combustion chamber level in the producer gas uptake. If the plug is removed, the gas lights, and should give a flame 9 in. to 12 in. long.

The fuel burned is that which passes through ⅞ in. square mesh and remains on ¾ in. square mesh screen, and is about 12·3 p.ct. of the weight of coal carbonized. Fires are cleaned each morning and false-barred once per week at the third step from the bottom, in order to remove such clinker and fine ash as has formed. Producer gas analyses are unusually good for this size fuel. The CO_2 content is rarely over 5 p.ct. and more frequently 3 p.ct., and the CO content varies from 24 to 32 p.ct., and is usually in the vicinity of 28 p.ct.

Pawtucket was one of the first companies in the U.S.A. to use heavy fuel oils in the water-gas plant. The use of this oil is now common practice in the United States, owing to its very favourable price.

Commenting on the article, " T.A.T. " says:

The average results obtained last winter showed a yield of 7·30 c.ft. of gas at 517 B.Th.U. gross per lb. of coal carbonized, equivalent to 16,350 c.ft. per English ton, the coal being Elkhorn Run-of-Mine, with about 5½ p.ct ash *plus* moisture

The producers are operated under pressure and using a coke which is not very saleable in the district, though some of it would be eminently saleable in this country. According to the article, the coke is passed over a ¾-in. screen (our report says ⅞ in.), and in order to obtain sufficient for the 12·3 p.ct. fuel required it was necessary to include all of the coke through a ⅞-in. screen. The gross coke made was 13·2 cwt. per ton of coal carbonized, so that more than 11 cwt. passed over the ¾-in. screen, and all this was available for sale. It showed 3·8 p.ct. volatile content, and was described as " very free burning."

INCREASED STORAGE AT STOKE-ON-TRENT

Inauguration of a 2 Million C.Ft. Waterless Holder erected by Messrs. R. & J. Dempster, Ltd., at the Etruria Works

Wednesday last witnessed the official inauguration of a 2 million c.ft. waterless holder at the Etruria Works of the Stoke-on-Trent Gas Department. When the ceremony was performed the holder was practically full, and the supply was released to the town when the main outlet valve was turned on by Alderman C. H. Bowers, Chairman of the Gas Committee, who congratulated the makers—Messrs. R. & J. Dempster, Ltd.—on a fine piece of British engineering.

Mr. J. Winson Scott, Managing Director of the contracting firm, thanked Alderman Bowers, and asked his acceptance of an inscribed silver salver as a souvenir of the occasion.

After the holder had been inspected, a luncheon was held.

Alderman W. T. Leason proposed "The Gas Department," and in doing so congratulated the Chairman of the Gas Committee, the Chief Engineer (Mr. A. Mackay), the officials, and the Committee on the distinction with which they had carried on the work of the Department, and their foresight in providing for the good of the city at large. People had said that gas was a back number, but the number of gas consumers in the city had risen from 49,136 in 1922 to 59,500 in 1932, while the amounts sold were 1266 million c.ft. in 1922, against 1585 millions in 1931. Capital expenditure per million c.ft. was now £500, against £600 in 1926. Of the Engineer (Mr. A. Mackay) Alderman Leason said: "He is a business man, and takes good care that any proposition he brings before the Committee is a sound one, and will give good financial results."

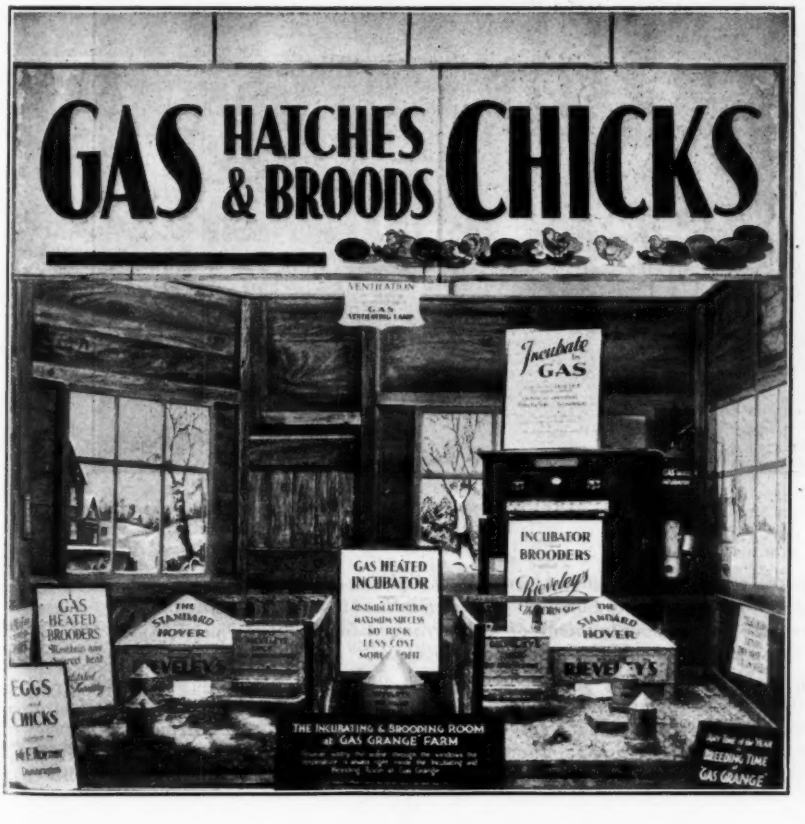
An Up-to-Date Works.

Alderman Bowers, who presided, responded to the toast: "We regard the new waterless holder as a further step in the development of our undertaking. As for industrial services, it is one of our proud feelings that we, along with our sister Committee, the Electricity Committee, are trying to do all we can to help local industries. We hope they will help us in their turn by co-operating and giving us all the assistance they can. One hears a lot of nonsense talked about the jealousy said to exist between the Electricity Committee and the Gas Committee. There is ample room for both of us, and we have to pull together and do our best in the interests of those we serve." Alderman Bowers made an appeal to the citizens to learn what the Gas Department has to offer them in new devices. He urged that they should use the showrooms, and see what the Industry could do. He added his endorsement of the tributes to Mr. Mackay, and said he was glad to bear witness that the heads of departments bore the heat of the day's work in Corporation affairs.

Alderman T. Mitchell, M.B.E., J.P. (Vice-Chairman of the Gas Committee), in proposing the health of the contractors, Messrs. R. & J. Dempster, Ltd., said: "Having known the contractors and some of the members of the firm a good many years, it is a pleasant duty I have to perform in proposing this toast. This firm has always had a splendid reputation for quality of the work produced. The design of the holder is comparatively new, and Messrs. Dempster are to be congratulated on the foresight in introducing expensive plant for the bending of the plates, which obviated any difficulties in the construction. The shell-work of this holder is of 'Armco' ingot iron, and practically rustless, which will add to the life of the holder. The foundations were entrusted to a local firm who have been successful in securing other work for such holders, so that they must have given every satisfaction. The whole of the work has been carried through to the entire satisfaction of our Engineer with a minimum of trouble."

Mr. J. Winson Scott, in reply, said it devolved upon him to deputize for his Chairman, Mr. Charles Dempster, who had suffered a domestic bereavement, and regretted his absence. Mr. Scott said it was a great pleasure to him, as representing the contractors, to hear the kind expressions which the proposer of this toast had made. "I have," he continued, "a very soft place in my heart for the Potteries, for in 1885 when I was an Articled Pupil, I was working at Messrs. Robert Heath's, Ford Green, on the erection of a bye-product plant. My duties have brought me in touch with the old local members of the Gas Industry, for whom I have a very high regard. There was Mr. Tapley, Engineer of Stoke, and John Young, formerly at the Etruria Works, whom I am pleased to say is as lively as ever. He was always a charming companion. Then there was Peaty, of Longport, Prince, Turtees, Jones, and Winstanley (Senior), of Newcastle-under-Lyme—all gentlemen with whom it has been my pleasant duty to be associated. Later we had Mr. Copp and Mr. Armitage, and two of these Engineers have held the position of President of the Institution of Gas Engineers, which speaks highly of their training in the Potteries."

The luncheon closed with the toast of "The Visitors," proposed by the Lord Mayor (Alderman Miss F. A. Farmer), and responded to by Mr. A. Brookhouse, a former Alderman in Stock-on-Trent, and now of Congleton.



Novel Window Display

This photograph is of a Chicken Incubating and Brooding Window which the York Gas Company have been exhibiting for the last two months. The chicks have been changed frequently, so as to keep them at the most attractive age, and the Company had an incubator actually working under gas, and the whole process of hatching out was visible to the public from the street. The "scenery" is the work of a local artist. Mr. H. E. Bloor, Engineer, Manager, and Secretary to the Company, explains that his Company were induced to make the experiment, which was highly successful, and has led to considerable business, through a similar display staged by the Preston Gas Company last year.

Examples of London's Gas Lighting

MONTAGUE PLACE.

MALET STREET.

*Depicted here are two more excellent examples of gas street lighting. These installations, which were only recently completed, are in London. The effective manner in which the road surfaces are illuminated by the employment of well-arranged low-pressure gas lamps is clearly indicated in the untouched photographs we reproduce. The top illustration shows Montague Place, and the bottom one Malet Street, both busy thoroughfares in the neighbourhood of the British Museum, the back of which can be seen in the top picture. The lamps were manufactured by Messrs. C. H. Kempton & Co., Ltd., of Stangate House, 235, Westminster Bridge Road, London, S.E.*1; *the type used being their "Kemborn," fitted with six bijou mantles staggered.*

THE "JOURNAL" TECHNICAL RECORD

Which contains Reports of Meetings of Gas and Allied Associations

Exhausting and Governing Gas from Retorts

By Roy Summerson, Assoc.M.Inst.Gas E., of Luton.

[Extract from a Thesis (for which the Author was awarded a Diploma of the Institution of Gas Engineers) before the London and Southern District Junior Gas Association, Jan. 29, 1932]

Consideration of the problems of exhausting and governing gas from retorts involves a detailed study of:

(1) The design of the retort house governor, its sensitivity, and its ability to maintain automatically any pre-determined "pull."
(2) The pressure conditions existing inside retorts throughout the whole cycle of operations.
(3) The pressure conditions existing outside retorts throughout the whole cycle of operations.
(4) The design and lay-out of offtakes and foul mains.
(5) The speed of withdrawal of gases from the carbonization zone in relation to the thermal and volume yield of gas per ton of coal carbonized.

The author has not attempted to investigate thoroughly all these items, but has confined himself mostly to those of the most immediate and obvious importance—that is, to the unexplained variations in pull at the vertical retort mouthpieces and to the working of the governor. Item 5 in particular is worthy of a separate study on its own, and could better be investigated under studies in carbonization.

The Retort House Governor.

It is usually claimed for retort house governors that they maintain a constant "pull" in the foul main irrespective of the unequal "make" of gas and of irregularities in exhauster "pull." This is their purpose, and an ideal governor would achieve this control perfectly.

It can be shown from theory that it is impossible for a retort house governor of the type installed at Luton to maintain automatically a constant pressure (pull) in the foul main near the retorts when the governor is situated a long way from the beds, both when the control pipe is connected immediately to its inlet side and when it is connected to the beginning of the foul main near the retorts.

The type installed at Luton is a widely used one. The central area of the bell covering the valve is sealed in water and is subject to the pull at the governor inlet. The outer annular area of the bell is subject to the pull communicated through the control pipe. These two pulls are not necessarily the same; nor is the extent of their simultaneous variation necessarily the same.

The designer of this governor probably intended that it should be fixed as close as possible to the retorts, with the control pipe connected immediately to its inlet. The mere existence of a separate control pipe, however, invites connection to any fancied spot in the foul main, while the existence of a central area of the bell so large, relatively, to the outer annular area is bound to ruin the automatic working of the governor for constant pressures near the retorts whenever the governor is fixed anywhere but at the closest possible point to the retorts. The design of the retort house governor could therefore be usefully modified by diminishing the central area of the bell till it is just sufficient for the valve rod to work in. It would then be immaterial where the governor was fixed, so long as the control pipe does, in fact, communicate to the governor bell the pressure changes going on in the foul main.

Experimental Investigations.

More than half the gas at the author's works is made on an installation of Woodall-Duckham continuous vertical retorts, and since it was at the mouthpieces of these retorts that the author first noticed the unsteadiness in the pull and the evident inability of the governing system to control it closely, he began his investigations there.

The retort house governor (14 in. diameter inlet and outlet) is situated on the ground level between two pairs of annular condensers. From the beginning of the foul main—*i.e.*, the point where the crude gases join in the retort house to form one main stream to the retort house governor—the gas travels through approximately 146 ft. of 15-in. main, 28 ft. of 14-in. main, a pair of annular condensers, and one 14-in. centre valve before reaching the governor; while the net drop in height from the beginning of the foul main to the retort house governor valve is 35 ft.

The carbonizing plant consists of six beds, A, B, C, D, E, and F, each containing four retorts. A and B beds contain old 7-ton type retorts, while the other beds contain new all-silica 5-ton type retorts. The maximum output of gas from these beds is considerably more than the present 15-in. foul main was originally designed for. The make, during the period of the author's tests ranged from 62,000 to 77,000 c.ft. per hour, all beds being at work with about 10 p.ct. of the retorts off for scurfing.

When the author began his investigations, the retort house governor was working with the control pipe connected to the beginning of the foul main, the control pipe being 1¼ in. diameter and 164 ft. long, and suffering a net drop in height of 31 ft. to the underside of the governor bell.

"Arkon" recorders were placed at a retort offtake (at the beginning of main stream in foul main); the Thorp recorder was placed at the inlet of the retort house governor; and a "Pontifex" recorder was placed at the bottom casting of the retort. The retort tested was the one in A, B, C, and D beds farthest from the retort-house governor.

Charts taken demonstrate that:

(i.) The pull, both at the retort offtake and at the beginning of the foul main, varies over a range of about two-tenths (the amount depending on the diligence of the governor attendant controlling the pulls).

(ii.) Every variation in foul main pull is reproduced similarly on the retort (and presumably on all the other retorts), and, therefore, if a constant pull could be guaranteed in the foul main, a more constant pull could be guaranteed in the retort mouthpieces.

(iii.) The loading of the governor must be altered by hand for every variation in make of gas, and that the governor in its present position is effectively automatic only for constant makes. Even then, its governing is only approximate.

(iv.) The pressure difference between the gas at the retort tested and the beginning of the foul main ranges between 0·18 and 0·27 in. W.G., the difference being greater for the greater makes of gas. This difference would be progressively less in the other offtakes nearer to the beginning of the foul main. It would seem, therefore, that it is impossible to guarantee identical pull on every retort for all makes of gas without having a governor to each retort, and this is scarcely practicable. Alternatively the foul mains might be suitably re-designed.

(v.) The pressure difference between the beginning of the foul main and the inlet of the governor ranges between

1·3 and 2·1 in. W.G. approximately, according to the make of gas. If it had been possible to obtain a continuous record of the rate of make of gas, it might have been possible to draw a graph for the pressure difference necessary for the range of makes experienced during the tests.

(vi.) The pull on the inlet side of the retort house governor varies by as much as 0·3 in. W.G., due to "hunting" and oscillation, without any alterations being made to the governor; this means that the governor in this position, from whatever cause, cannot give a control finer than about ± 0·15 in. W.G. at its inlet.

(vii.) The governor frequently hunts over a range of about 0·3 in. W.G. during a period of about twenty minutes. This hunting is liable to take place at any time. This effect produces a corresponding variation at the beginning of the foul main and at the offtake of the retort of about 0·05 in. W.G. The author cannot explain this hunting effect, although he has often watched it happening; such a long period of hunt as twenty minutes is extraordinary.

(viii.) The governor does not re-adjust itself properly for alterations in exhauster pulls.

(ix.) The retort bottom pressure varies widely, independently of the retort top pressure.

During the course of these tests, the author also observed that:

(x.) So long as the charge was freely travelling down the retort, poking made no difference to the top pressure.

(xi.) When the retort is working badly, and takes its coal unevenly, the top pressure suffers sudden increases.

(xii.) Drawing coke from the retort does not affect the top pressure.

(xiii.) The vertical lines in the record on all charts taken at the retort offtake and the beginning of the foul main are due to momentary alterations in the speed of No. 2 exhauster, due to sudden demands on the exhauster steam main by a large hydraulic pump.

Sensitivity of the Retort House Governor.

In general, these tests show that this type of retort house governor is not a very sensitive piece of apparatus. If it were infinitely sensitive, an infinitesimal alteration in the pressures acting on the area of the bell would move the bell and valve, but in practice friction must be overcome—the friction of the arm turning on its bearings, and the friction of the valve sliding in its sleeve, and the friction of the bell moving through the water. Now the smallest weight used on the governor counterbalance in these tests weighed 1·5 lbs., but more often than not it seemed to make little or no difference. The 3 lb. weight usually did make an appreciable difference to the pull at inlet governor—*i.e.*, we may take it that the minimum weight which permanently alters the position or range of movement of the bell and valve is 3 lbs. Calculation shows that a 3-lb. weight should make a difference of about 0·08 in. W.G. That is, we may take it that the minimum alteration in gas pressure at the inlet of the governor which will be sufficient to overcome friction and move the bell and valve to a different position is about 0·08 in. W.G. The author does not know what alteration in flow of crude gas past a certain point in a 14-in. main will alter the pressure at that point by, say, 0·08 in.; the alteration in flow would possibly be quite an appreciable percentage on the make. In short, the outstanding defect of this type of retort house governor is that the power required to move the bell and valve has to be derived from alterations in the inlet gas pressure due to alterations in the rate of flow. Some other designs of retort house governor on the market—the relay type—derive the power necessary to operate the valve from an external source, though when it is claimed for such governors that they are sensitive to within one-fortieth of an inch W.G. the author is of the opinion that the size of the foul main and the alteration in flow which causes a pressure alteration of one-fortieth of an inch W.G. should be definitely known. The author's work has certainly shown him (visually) that an alteration in pressure of one-fortieth of an inch W.G. at the vertical retort mouthpieces, as shown on the "Arkon" recorder, makes an appreciable difference to the ingress of air or loss of crude gas at the rodding holes when rodding. If, therefore, any attempt is to be made to control the pressure at the retort mouthpieces to within one-fortieth of an inch W.G. it will be very necessary to pay the most careful attention to the proportions of the gas offtakes and foul mains, right from the retort to the governor.

Bottom Pressures at the Continuous Vertical Retorts.

The author took a few records of bottom pressures with an "Arkon" on the retort tested above. Results show that there are times when the variations in the bottom pressures correspond in some measure with the variations in the top pressures. At other times, they bear no relation. In other words, they cannot be entirely controlled by the top pressure conditions. In general, of the two pressures, the bottom is usually the less and is very frequently somewhere between −0·2 in. W.G. and level gauge. At times, however, the bottom pressures become relatively considerable—as much as +2·5 in. W.G., or sufficient to blow the water seal in the coke door.

These bottom pressures raise some interesting problems. The author is of opinion that bottom pressures higher than −0·2 in. W.G. should be avoided if possible, otherwise loss of gas will occur through any holes or leaky joints that there may be in the retorts; the author has often seen it occur.

Factors affecting the bottom pressures are:

(1) The swelling properties of the coal.
(2) The size or sizes of the coal particles fed to the retort.
(3) The taper of the retort.
(4) The horizontal heat zoning of the retort.
(5) The rate of throughput of coal.
(6) The manner in which different varieties of coal follow one another.

The author has not investigated these factors in detail experimentally, and did not attempt to keep a record of the mixture of South Yorkshire coals (mostly nuts of various sizes) fed into the retort under test during the period of the tests. He is convinced that tests for the evaluation of coals for continuous vertical retorts should regularly include a swelling test, a sieving test for sizes, and a test for percentage of voids.

Freedom from excessive bottom pressures can be secured by the use of moderately swelling coals, as far as possible, and by ensuring that the sizes of the coal as fed to the retorts allow a high percentage of voids on the volume of coal *plus* voids: run-of-mine coal is bad from this point of view, as, like a dry concrete mixture, there are very few voids and therefore little room for swelling. The swelling effect is probably less sudden when the retorts are worked with moderate top heats and high middle heats, and with higher throughputs.

It was noticed during the tests that high bottom pressures may exist even though the charge is working freely down the retort on its own.

Effect of a Long Control Pipe.

To prove whether a long length of control pipe to the retort house governor really does communicate the pressure in the foul main to the governor bell or to a recorder at its other end, without any time lag, "damping out" effects, or differences due to the different heights of the ends, the author took some records with "Arkon" recorders working simultaneously at each end of it. Charts taken show that:

(i.) There is no time lag through a long length of control pipe.

(ii.) There is no "damping out" effect.

(iii.) The actual foul main pressure *is* communicated to the far end of a long control pipe.

Pressures in the Combustion Chambers and Heating Flues.

To compare the pressures in these flues with those already found in the interior of the retort, charts were taken with the "Arkon" recorders connected to (1) the top sight-hole looking into the combustion flues from charging floor level, and (2) the bottom horizontal collecting flue, immediately after the waste-gas damper at bottom of combustion chambers—*i.e.*, at a level 4 ft. above the bottom of the retort.

Such charts show for C, D, E, and F beds that the pressure at

(1) the top of the combustion chambers is level gauge or two or three hundredths of an inch W.G.;

(2) the bottom collecting flues is approximately −0·2 in. W.G.

The pressures in between points (1) and (2) are most probably in between the values found for points (1) and (2).

For A and B beds, which differ from C, D, E, and F beds in having no recuperators, the pressure at the top is about level gauge, but at the waste gas damper is about −0·45 in. W.G.

The charts, together with those previously taken for gas pressures in the retorts, therefore demonstrate that:

(i.) The pressures as between the inside and the outside

of the retorts at the top will scarcely differ at all so long as the pull at the retort gas offtakes is at level gauge; such a pull as level gauge also has the advantages of preventing ingress of air through leaky rodding plugs, &c., and of preventing the offtakes from getting hot through over-pulling.

(ii.) So long as the type and size of coal and manner of heating the retort, &c., are regulated to avoid bottom pressures inside the retort above about −0·2 in. W.G. the loss of gas through leaky brickwork is considerably minimized.

(iii.) There will be a tendency, particularly in A and B beds, to loss of gas and local overheating in the flues when the bottom pressures rise much above −0·2 in. W.G.

(iv.) In any case there will be little tendency for waste gases to enter the retorts, as their pressure is rarely higher than that of the gas in the retorts.

The sudden little jumps in pressure in the flues while the fires are being ashed out and pricked up are due to the fire doors being wide open and a consequent large increase in primary air supply to fires. Normally, the primary air slides to each fire are open to the extent of from 12 to 24 sq. in. only.

Investigations on an Old Installation of Horizontal Retorts.

To supplement the data obtained on the vertical retort installation, the author made some investigations on an old installation of six beds of stop-ended horizontal retorts in the No. 1 house at his works. The results are interesting as representing old-fashioned practice. These beds are not now worked, owing to modernization of No. 2 house, horizontals.

The six beds, numbers 1 to 6, each contain eight stop-ended retorts, Ω-shaped, 21 by 15 in. by 9 ft. 6 in. long, with 6 in. diameter ascension pipes. Each bed has its own hydraulic main with its own 6 in. gas offtake and valve to 12 in. foul main, and its own tar and liquor run off to the tar tower, which is common to the six beds. The retort house governor, which has 8-in. inlet and outlet connections, and is of similar design to that on the vertical retorts, is placed centrally between the six beds; that is, it is working as close as possible to the retorts.

Charts were taken—

(*a*) With the "Pontifex" recorder connected to the ascension pipe of the bottom left retort in No. 1 bed. This retort was selected as being one of the two farthest from the governor.

(*b*) With the Thorp recorder connected immediately to the inlet of the retort house governor.

The retorts are hand-charged, the charge being approximately 2·5 cwt. and the period of carbonization being 6 hours. One-third of the forty-eight retorts are charged every two hours, at the odd hours of the clock, as follows:

Time of Charging.	Number of Retort.					
	Bed 1.	Bed 2.	Bed 3.	Bed 4.	Bed 5.	Bed 6.
3 p.m.	1, 2, 3	4, 5	1, 2, 3	1, 2, 3	4, 5	1, 2, 7
5 ,,	4, 5	1, 2, 3	6, 7, 8	4, 5	1, 2, 3, 6	3, 8
7 ,,	6, 7, 8	6, 7, 8	4, 5	6, 7, 8	7, 8	4, 5, 6

At every draw, nine of the retorts are first drawn and charged—*i.e.*, nine mouthpieces are opened together, and are closed as the retorts are charged; then the remaining seven are drawn and charged. The time taken to draw and charge sixteen retorts (three men) is about forty minutes.

Charts taken demonstrate that:

(i.) The pressure in the retort falls off during the period of carbonization from a mean of about + 0·9 in. W.G. to a mean of about + 0·1 in. W.G.

(ii.) The pressure in the retort increases slightly very soon after the other retorts in that bed are freshly charged.

(iii.) The pressure in the retort is lowered occasionally by too rapid draining of the tar tower.

(iv.) The pressure in the retort, and the oscillation, are increased rapidly if the draining of the tar tower is neglected.

Bearing in mind that for about forty minutes after every odd hour of the clock, retorts are being drawn and charged—that is, that all the lids are closed for eighty out of every one hundred and twenty minutes, results demonstrate that:

(i.) Oscillation on the inlet side of the governor is increased during the forty minutes of the draw and charge, and the governor inlet shows the least pull during this time.

(ii.) After the charge and draw, the pull gradually increases as the make decreases during the one hundred and twenty minutes before the next draw and charge. In other words, the governor fails to maintain a constant pull on its inlet side irrespective of the make. The variation appears to cover a range of about 0·1 in. W.G.

(iii.) When draining of the tar tower is neglected and tar collects in the hydraulic mains, the oscillation on the inlet side of the governor increases.

In general, this type of retort house governor, even when situated as close as possible to the retorts and a long way from the exhausters, does not seem capable of governing the pull more closely than nearly ± 0·1 in. W.G. when the makes vary periodically.

Oscillation at the Inlets of the Retort House Governors.

Charts were taken at the inlet of the governor in No. 1 house horizontals, with the "Pontifex" diaphragm recorder working at maximum oscillation. The oscillation covers a range of nearly ± 1·0 W.G. at times, and even more when the dip pipes become sealed in tar.

The oscillation was also found to be nearly ± 1·0 in. W.G. on the inlet of the vertical retort house governor. Evidently an oscillation of nearly ± 1·0 in. W.G. is caused by the exhausters, while in the case of the horizontal retorts, the extra oscillation shown on charts taken from the offtake pipes is caused by the seal of the dip pipes. The less the seal, therefore, the less the oscillation in the retorts.

Pressure Conditions in the Combustion Chambers and Heating Flues of the Horizontal Settings.

To compare the pressures in these flues with those already found in the interior of the retort charts were taken with the "Arkon" recorders connected to (*a*) the sight hole in the combustion chamber just above the producer arch, (*b*) the removable "header" just below the crown of the setting arch. This is 6 ft. above (*a*). (*c*) The waste gas flue under the bottom right retort, just before the entry to the regenerator. This is 7 ft. below (*b*). The charts demonstrated that:

(i.) The pressure in the combustion chamber averages + 0·05 in. W.G.

(ii.) The pressure under the crown of the setting arch averages + 0·1 in. W.G.

(iii.) The pressure at the entry to regenerator averages + 0·04 in. W.G.

(iv.) All three points show a slight decrease in pressure when the producer lid is off for firing up producer.

(v.) There is no periodical variation in pressure between times of firing up or clinkering.

Comparing these pressures with those found in the interior of the retorts, it is evident that:

(vi.) There will be a tendency for loss of gas into the heating flues during most of the carbonization period, as the coal gas pressure has an excess of up to about 0·9 in. W.G. over the waste gas pressure.

(vii.) There will be little tendency for influx of waste gases into the retort. Such influx, if any, will be caused mainly by oscillations due to the seal.

(viii.) The seal on these dip pipes could be usefully lowered by 0·5 in., while the loading of retort house governor could be decreased during the period of drawing and charging in order to prevent entry of air through ascension pipes to foul main.

(ix.) There is no need for the pressure in the retorts to be taken lower than +0·04 in. W.G.—*i.e.*, the lowest waste gas pressure in the setting.

(x.) Any method, such as suitably regulating the size of the coal fed to the retort, which will decrease the rate of gas evolution in the early stages of the carbonization period and increase it towards the end, will be useful in minimizing the excess of crude gas pressure over the waste gas pressure in the setting.

Dr. Parker has shown that the smaller sizes of coal evolve gas at a slower rate in the initial stages and at a faster rate in the final stages of carbonization than the larger sizes of coal.

This fact, together with the fact that large coal in continuous vertical retorts offers a freer passage to the gases, a greater proportion of voids, more room for swelling, and therefore less tendency to bottom pressure, lends support to the practice suggested by some engineers of screening their coal as received, carbonizing the large on the verticals and the fines on the horizontals, for it benefits

both systems and tends towards less leakage of gas from retorts by minimizing internal pressure.

APPENDIX.

TABLE I.—*Vertical Retorts.*

Gas from Retorts.	Diameter of Main and Description.	Area of Main.	Gas Flow per Min.	Average Linear Gas Velocity.	Relative Velocities Taking Lowest as 1.
		Sq. Ft.	C.Ft.	Ft. per Min.	
A1	9 in. offtake	0·4418	78	176	3·9
A1, A2 . . .	12 in. uptake	0·7854	156	198	4·4
A1, A2 . . .	15 in. foul main	1·227	156	126	2·8
A1, A2, A3, A4 .	15 in. foul main	1·227	311	254	5·6
A1, A2, A3, A4, B1, B2, B3, B4	15 in. foul main	1·227	622	508	11·2
D4	7 in. offtake	0·2672	56	208	4·6
D4	8 in. uptake	0·3490	56	159	3·5
D4	15 in. foul main	1·227	56	45	1·0
D4, D1 . . .	15 in. foul main	1·227	111	90	2·0
D4, D1, C1 . .	15 in. foul main	1·227	167	136	3·0
D4, D1, C1, C4 .	15 in. foul main	1·227	222	181	4·1
D4, D1, C1, C4, D3, D2, C3, C2	15 in. foul main	1·227	445	373	8·2
All A, B, C, and D Beds . .	15 in. foul main	1·227	1067	870	19·1
F4	7 in. offtake	0·2672	56	208	4·6
F4, F3, F2, F1 .	12 in. uptake	0·7854	222	283	6·2
F4, F3, F2, F1 .	24 in. foul main	3·142	222	71	1·6
F4, F3, F2, F1, E1, E2, E3, E4	24 in. foul main	3·142	445	142	3·2
F4, F3, F2, F1, E1, E2, E3, E4	15 in. foul main	1·227	445	373	8·2
All 24 retorts in A, B, C, D, E, and F Beds .	15 in. foul main	1·227	1512	1232	27·2

TABLE II.—*Horizontal Retorts.*

Gas from Retorts.	Diameter of Main and Description.	Area of Main.	Average Gas Flow per Min.	Average Linear Gas Velocity.	Relative Velocities Taking Lowest as 1.
		Sq.Ft.	C.Ft.	Ft. per Min.	
No. 1, No. 1 bed .	6 in. ascension pipe	0·1963	4	21	5
No. 1 bed, 8 retorts	6 in. offtake from hydraulic main	0·1963	33	133	31·3
No 1 bed . . .	12 in. foul main	0·7854	33	4·2	1
Nos. 1 and 2 beds.	12 in. foul main	0·7854	67	8·5	2
Nos. 1, 2, and 3 beds	12 in. foul main	0·7854	100	13	3
Nos. 1, 2, 3, 4, 5, and 6 beds . .	8 in. governor inlet	0·3490	200	573	135

[Our report of the discussion will be published in the "JOURNAL" next week.]

ANNUAL DINNER AND DANCE.

Held last Friday at the Florence Restaurant, Rupert Street, Piccadilly, W. 1, the Nineteenth Annual Dinner and Dance of the London and Southern District Junior Gas Association was attended by over a hundred members and their ladies, who were received by the President, Mr. J. HOWARD GOLDSMITH (of the South Suburban Gas Company) and Mrs. Goldsmith. Among the guests were many well-known figures in the Gas Industry, including Mr. J. R. W. Alexander, Secretary of the Institution of Gas Engineers, Mr. Wilfrid Wastell, General Manager of the South Suburban Company, and Mr. F. Gorman, Engineer of the same Company, Mr. H. C. Smith, Engineer of the Tottenham and District Gas Company, Mr. R. J. Milbourne, donor of the Milbourne Medal, and Mr. J. Stuart Ker, Principal of the Westminster Technical Institute, where the Association hold their technical meetings.

The Loyal Toast having been honoured, the next toast—that of "The London and Southern District Junior Gas Association"—fell to the capable hands of Mr. H. C. SMITH, who remarked that he was in the position he was that night owing to the unavoidable absence of the President of the Southern Association, Mr. R. H. Ruthven. The connection between the Senior and Junior Associations, he went on, had been a long and pleasant one, and he was sure that the members of the Senior body would be the first to acknowledge the value of the work done by, and the assistance obtained from, the members of the Junior Association.

Several Associations, continued Mr. Smith, had been formed from time to time, the initiation of which had generally been due to a few far-sighted engineers who realized that by meeting together and discussing their various problems and by pooling their information they would benefit one another and, ultimately, the whole Industry. Of these bodies by no means the least important were the Junior Associations, of which the London and Southern District Junior Association was a shining example.

In proposing this toast, he wished to couple with it the name of the President of the Association, Mr. J. H. Goldsmith. He was sorry their old friend Mr. John Terrace was not there to tell them more about Mr. Goldsmith; but they all knew him so well and appreciated the value of his work in the Association that there was no need for anything more to be said to commend the toast to them. His election as President was a fitting appreciation of his past services to the Association, and he wished him all success during the remainder of his year of office.

THE MILBOURNE MEDAL.

The toast was accepted with enthusiasm, and the PRESIDENT rose to reply on behalf of the Association, thanking Mr. Smith for all he had said, and hoping that they would always merit his remarks.

There was one matter that he particularly wished to mention, and that was the gift of a silver medal to the Association by a gentleman who was a guest among them that evening—the medal to be awarded each session to the author of the best paper presented at their meetings by a member. The gift of such a medal by a gentleman who had so far not been closely associated with their activities, showed the appreciation of the Industry generally of their efforts. Mr. R. J. Milbourne was the gentleman to whom he referred, a name well-known to all throughout the Gas Industry. The kind thoughts that prompted such a gift were much appreciated by the Council.

The next toast was that of "The Visitors," which was ably proposed by Mr. A. TENNANT, of the East Surrey Gas Company, Senior Vice-President of the Association, who said that they were honoured that evening with the company of gentlemen whose names are well-known in the Industry, and who, by their presence on that occasion, had shown an interest in the work and welfare of their Association. They not only appreciated their company, but were very grateful to them for the facilities they granted to members in permitting visits to the works under their control, and for the encouragement they gave to the junior members of their staff in allowing them to attend the meetings.

Acknowledgment of this toast was made by Mr. J. R. W. ALEXANDER, Secretary of the Institution of Gas Engineers, who spoke of the appreciation which the parent Institution had for the work of the Junior Associations. They might think that very little notice was taken of that work, but he could assure them that it was all noted by the Council of the Institution and was strictly recorded. The future of the Institution, so far as new members were concerned, was in the hands of the Junior Associations.

Continuing, Mr. Alexander said how pleased he was to know that Mr. Milbourne had endowed a medal. The Gas Industry was very fortunate in its endowments; Mr. Milbourne had followed two eminent Gas Engineers who had endowed scholarships and medals for the Industry. He referred to the William Cartwright Holmes endowment of £3000 and the Charles Hunt Memorial Medal in Gas Engineering and Gas Supply. In conclusion, he acknowledged the very generous hospitality they had received that evening.

An innovation was made this year by the Association in that the nineteenth Annual Dinner was followed by a short variety entertainment and then dancing until midnight instead of the extended variety concert as in previous years, and the change proved extremely popular among the members. Indeed, the whole function was an undoubted success, great credit being due to the Hon. Secretary, Mr. F. H. Higton, for the arrangements.

REGISTER OF PATENTS

Grease Seal for Waterless Holders.—No. 361,692.

WAGNER, R., of Berlin-Charlottenburg.

No. 1045; Jan. 12, 1931. Convention date, Jan. 13, 1930.

The invention relates to arrangements for gas-tight packing of waterless gasholders. The object is to combine the inherent advantage of grease packing with the easy accessibility and supervision of liquid sealing.

In the accompanying drawing an embodiment of the invention is shown, fig. 1 being a vertical section. The packing strips form one an upper and one a lower ring 1 of segments of soft wood or iron about 1200 mm. long which interleave with each other at the ends. They are provided with grooves 3 in which materials such as rubber, felt, or the like are inserted which are intended to keep out all impurities, moisture, ice, dust, and the like, assisting the action of the segments which fit snugly on the gasholder wall. Against large external obstacles this effect is supplemented by continuous felt or rubber strips 4 and chamfered strips 5 of hard lead, with which the two rings of segments are fitted at the extreme top and bottom. The lower ring wipes off all foreign objects downwards into the holder, and the upper ring, by means of a continuous circular roof surface 6 of sheet metal fitted to it, also wipes them off into the inner part of the disc where they cannot interfere with the packing, and can easily be removed from time to time.

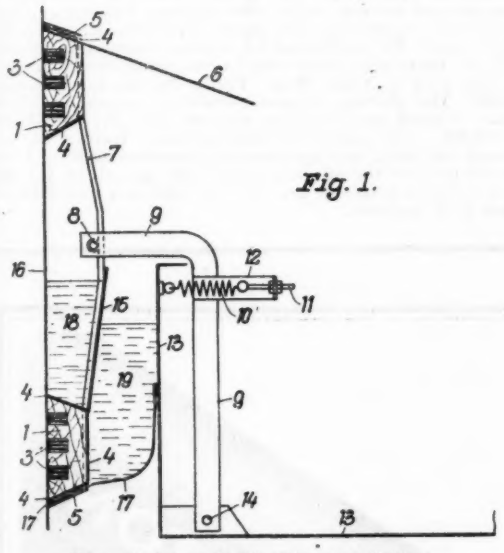


Fig. 1.

Wagner's Grease Seal for Waterless Holders.

The two rings are connected to each other at successive distances of about 600 mm. by flat iron arms 7 screwed on. Thus two arms are located on each wood segment. These arms are supported at their middle by means of a connecting round iron bar 8 on two levers 9 in such a manner that through the weight alone of the whole system a good pressure is continuously assured on the gasholder wall. The spiral springs 10, adjustable to a suitable tension by screws 11, are fixed at the one end to a connecting arm 12 of the two levers 9, and at the other end to the vertical edge wall of the disc 13. Their function is the location of the disc 13 in the holder and that of a safety device. The levers 9 oscillate about pins 14 which are inserted just above the bottom of the disc 13. A yieldable membrane 17 of leather, jute, rubber, hemp with wire insertion, or the like, connects the lower edge of the strip 1 with the wall of the disc 13, and thus constitutes the bottom of a channel filled with soft, plastic grease. This membrane does not need to be gas-tight but only grease-tight.

All arms 7 are connected together towards the inside of the holder by a wall 15 of sheet metal, wire gauze, wire netting, hemp with strip iron insertion, or the like.

This wall 15 may be closed or provided with openings. If the local temperatures throughout the whole year are high enough for there to be no fear that the arms 7 in their small sideways movement do not work vertical channels in the grease, through which the gas could escape, this wall 15 may be omitted. The wall 15 when fitted thus provides security even when the grease becomes very stiff, as the grease chamber 18 does not vary in width and the walls of the variable width grease chamber 19 have no sharp edges. Thus the grease is not detached from the walls, but only its upper surface is lowered when the chamber gets wider, as has been found in experience.

Water Heaters.—No. 361,329.

THE GAS LIGHT AND COKE COMPANY, CLARK, J. G., MASTERMAN, C. A., and NOBLE, T. G., all of Westminster, S.W. 1.

No. 16,718; Aug. 6, 1930.

A perforated metallic baffle member of hood shaped or laterally corrugated or sinuous form is interposed in the path of the heating medium so as to create turbulent action, in order to remove wholly or in part any film or insulating gas which may exist on the surface or surfaces of the water container. The corrugations on the baffle plate may be of constant pitch, the amplitude of the corrugations decreasing from the top to the bottom of the said plate. The amplitude of the corrugations may remain constant while the pitch varies. The heating medium ascends in contact with the surfaces to be heated as well as through the baffle and into contact with the surfaces to be heated. The perforations, which may be in the form of slots or holes in the baffle, may be oppositely or staggeredly arranged so that the heating medium can ascend in the baffle or the space in which the baffle is disposed and pass through the slots or holes into the space between the baffle and the surfaces to be heated. The action of the baffle is such as to maintain the maximum velocity of the combustion gases along the surfaces of the water container while providing intimate turbulence at the slots or holes wherever further increments of heating medium or combustion gases flow into the stream of heating medium which also flows upwardly between the baffle and the surfaces to be heated.

The apparatus according to the present invention may have one or more than one water container and one or more than one burner of any suitable form, such as a gas ring burner or a perforated tube or tubes extending longitudinally of or circularly of the apparatus. The burner may be disposed centrally of the apparatus or two or more than two burners may be used disposed one at each side of and underneath the apparatus so that the hot gases pass upwardly and in contact with the baffle and in the space between the baffle, two or more than two of which may be used, and the liquid containers. The perforated baffle may be hood shaped and of rectangular form or of circular form as seen in plan, and is closed at the upper end.

Doors of Ovens and Retorts.—No. 361,929.

GAS CHAMBERS AND COKE OVENS, LTD., BOWATER, N. J., and RITSON, F., all of Westminster, S.W. 1.

No. 25,631; Aug. 27, 1930.

This invention provides a construction of door and door frame in which one of said members is provided with a flange adapted to bear on a flexible sheet metal seating resiliently mounted in the other of said members, and adapted to conform to any unevenness in the door sealing surface and thus to compensate for any warping or distortion of the door.

PARLIAMENTARY INTELLIGENCE

[From Our Special Correspondents.]

House of Lords.

Special Orders.

Special Orders made on the application of the Sedgley Urban District Council and the Darlington Borough Council have been laid before the House and referred to the Special Orders Committee.

Private Bills.

It has been decided that the following Gas Bills are to originate in the House of Lords: Gas Light and Coke Company; South Metropolitan Gas. It was proposed that the Brownhills Urban District Council's Bill providing for the transfer of the local Gas Company should also originate in the Lords, but the Bill has now been withdrawn as a result of the adverse decision of the ratepayers.

House of Commons.

Private Bills.

A petition has been presented against the South Suburban Gas Bill by Mr. E. T. Campbell, M.P. for Bromley, on behalf of "Owners of Property and Residents at Bromley.

Petitions have been presented against the Bury Corporation Bill by Messrs. Dyson, Bell, & Co., on behalf of the Radcliffe and Little Lever Joint Gas Board; against the Kettering Gas Bill by Messrs. Lees & Co., on behalf of the Kettering Urban District Council; against the Mid-Southern Utility Bill by Messrs. Sherwood & Co., on behalf of the West Sussex County Council, and by Messrs. Rees & Frères, on behalf of the Surrey County Council; against the Scarborough Gas Bill by Messrs. Sharpe, Pritchard, & Co., on behalf of the Scarborough Corporation; against the South Staffordshire Water Bill by Messrs. Dyson, Bell, & Co., on behalf of the Dudley, Brierley Hill, and District Gas Company; against the South Suburban Gas Bill by Messrs. Lees & Co., on behalf of the Bromley Urban District Council, and "Owners, Lessees, and Occupiers of property affected in the Parish of West Wickham," by Messrs. Blyth, Dutton, & Co., on behalf of the Society of British Gas Industries, by Messrs. Sharpe, Pritchard, & Co., on behalf of the Beckenham Urban District Council and the South-Eastern Tar Distillers, and by Mr. A. Flaxman on his own behalf.

A Special Resolution under Standing Order 72 has been deposited in connection with the Oakham Gas and Electricity Bill.

All these Bills and the Commercial Gas Bill have been read a first time.

Special Orders.

Special Orders made on the application of the Sedgley Urban District Council and the Darlington Borough Council have been presented and ordered to lie on the table of the House.

Plans have been deposited in connection with the Cambridge University and Town Gas Special Order.

Gas Undertakings' Results in 1931.

Durham.

At the annual meeting of the City of Durham Gas Company the Chairman (Alderman A. Raine) said they were down by the small sum of £121 on the sale of gas, which he attributed to the recent mild weather which affected both lighting and heating. It was satisfactory to report, however, a considerable saving in cost. The profit and loss account showed an available balance of £9342 after deducting an interim dividend of £2301 which was paid in August last. Profits for the year amounted to £6608. The revenue account showed an income of £30,461, of which £24,102 was from the sale of gas. Its manufacture cost £14,394, with £3405 for distribution. Rates and taxes accounted for £3272 and management expenses £1688. A dividend of 5 p.ct. on the original capital and 3½ p.ct. on the additional capital, less income-tax, for the half-year ended Dec. 31 last has been declared.

STOCK AND SHARE LIST.

Official Quotations on the London and Provincial Stock Exchanges.

[For Stock Market Report, see later pages.]

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. Feb. 6. (Provincial Exchanges Feb. 5.)	Rise or Fall on Week.	Transactions. Lowest and Highest Prices During the Week.
£			% p.a.	% p.a.				
1,551,868	Stk.	Oct. 5	7⅞	7⅞	Alliance & Dublin Ord. ...	103—108	...	...
374,000	"	Jan. 4	4	4	Do. 4 p.c. Deb. ...	65—70	...	...
522,655	"	Aug. 24	7	7	Barnet Ord. 7 p.c.	120—125	...	...
300,000	1	Oct. 19	1/9⅝	1/4⅛	Bombay, Ltd.	15/—17/6	...	16/9
174,500	10	Aug. 10	9	9	Bournemouth 5 p.c. ...	14⅜—15⅜	...	...
500,050	10	"	7	7	Do. B 7 p.c. ...	12—13	...	...
439,160	10	"	6	6	Do. Pref. 6 p.c. ...	10½—11½	...	...
50,000	Stk.	Dec. 14	3	3	Do. 3 p.c. Deb. ...	53—58	...	...
162,025	"	"	4	4	Do. 4 p.c. Deb. ...	73—78	...	...
210,000	"	"	5	5	Do. 5 p.c. Deb. ...	92—97	...	...
357,900	"	Aug. 24	7½	7½	Brighton & Hove 6 p.c. Con.	114—119	...	...
371,880	"	"	6⅔	6⅔	Do. 5 p.c. Con.	104—107	...	...
1,287,500	"	July 23	5	5	Bristol 5 p.c. max.	90—92[a]	+2	...
120,420	"	Jan. 4	4	4	Do. 1st 4 p.c. Deb. ...	77—79[a]	...	...
217,870	"	"	4	4	Do. 2nd 4 p.c. Deb. ...	77—79[a]	...	...
328,790	"	"	5	5	Do. 5 p.c. Deb.	97—98[a]	...	...
855,000	"	Oct. 5	8	7	British Ord.	108—113	...	...
100,000	"	Jan. 4	7	7	Do. 7 p.c. Pref.	108—113	...	...
120,000	"	"	4	4	Do. 4 p.c. Red. Deb. ...	70—75	...	...
450,000	"	"	5	5	Do. 5 p.c. Red. Deb. ...	90—95	...	...
160,000	"	Jan. 4	5	5	Cambridge 5 p.c. Deb. ...	90—95	...	...
100,000	10	Nov. 30	8	6	Cape Town, Ltd.	8⅜—9⅜	...	...
100,000	10	Oct. 30	4½	4½	Do. 4½ p.c. Pref. ...	6¾—7¾	...	...
150,000	Stk.	Jan. 4	4½	4½	Do. 4½ p.c. Deb. ...	65—70	...	...
626,860	"	July 23	6	6	Cardiff Con. Ord.	95—98	...	...
237,860	"	Jan. 4	2½	5	Do. 5 p.c. Red. Deb.	91—96	...	...
157,150	"	Aug. 10	6⅛	5	Chester 5 p.c. Ord.	87—92[b]	...	...
98,936	1	Oct. 5	1⅔/-	2/-	Colombo, Ltd. Ord.... ...	27/—32/-	...	...
24,500	1	"	1/4⅛	1/4⅛	Do. 7 p.c. Pref.	17/—19/-	...	...
609,204	1	Oct. 19	1/3'27	-/10'90	Colonial Gas Assn. Ltd. Ord.	10/—15/-	...	...
296,053	1	"	1/5'67	1/2'54	Do. 8 p.c. Pref.	10/—15/-	...	...
2,073,280	Stk.	July 23	6	6	Commercial Ord.	93—96	+2	94—95
475,000	"	Dec. 14	3	3	Do. 3 p.c. Deb. ...	51—56	...	...
807,560	"	Aug. 10	7	7	Croydon sliding scale ...	107—110	...	107—108½
469,590	"	"	5	5	Do. max. div.	81—84	...	...
542,270	"	Aug. 24	10	7	Derby Con.	120—125[c]	...	...
55,000	"	Jan. 4	4	4	Do. Deb.	65—70[c]	...	...
209,000	"	Sept. 7	5	5	East Hull Ord. 5 p.c. ...	71—76	...	...
179,500	"	Aug. 24	5½	5½	East Surrey Ord. 5 p.c. ...	86—91	...	...
155,019	"	Jan. 4	5	5	Do. 5 p.c. Deb. ...	90—95	...	...
1,002,180	"	Sept. 21	16½	14	European, Ltd.	103—113	...	105—105½
18,911,138	"	July 23	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	18/6—19/6/	+·/3	18/1½—19/6
2,600,000	"	"	3⅛	3⅛	Do. 3⅛ p.c. max.	54—59	+1	58
4,294,691	"	"	4	4	Do. 4 p.c. Con. Pref. ...	72—77	+1	73½—76
5,694,095	"	Dec. 14	3	3	Do. 3 p.c. Con. Deb. ...	55—60	...	58 59½
3,642,770	"	"	5	5	Do. 5 p.c. Red. Deb. ...	93—98	...	98
2,500,000	"	"	—	4½	Do. 4½ p.c. Red. Deb. ...	85—90	...	88—90
161,480	"	Sept. 7	10	10	Harrogate Cons. 10 p.c. max.	157—162	...	...
82,500	"	Aug. 24	7	7	Hastings & St. L. 5 p.c. Conv.	95—100	...	...
258,740	"	"	5½	5½	Do. 3½ p.c. Conv.	81—86	...	...
70,000	10	9 Oct. '30	§	10	Hongkong & China, Ltd. ...	11—12	−1	11⅞—11½
213,200	Stk.	Aug. 10	6	6	Hornsey Con. 3½ p.c. ...	89—92	...	...
2,800,000	"	Oct. 30	25	15	Imperial Continental Cap.	320—340	...	325—331
223,130	"	Feb. 1	3½	3½	Do. 3½ p.c. Red. Deb.	68—73[b]	−2	...
235,242	"	Aug. 10	8½	8½	Lea Bridge 5 p.c. Ord. ...	129—132	...	...
2,145,907	"	Aug. 24	6	6	Liverpool 5 p.c. Ord. ...	97⅞—98⅝[b]	−⅜	...
306,083	"	Jan. 15	4	4	Do. 4 p.c. Deb. ...	78—80[b]	...	...
165,736	"	Aug. 24	9	8	Maidstone 5 p.c. Cap. ...	123—128	...	...
56,176	"	Jan. 4	3	3	Do. 3 p.c. Deb. ...	51—56	...	...
75,000	5	Nov. 30	110	110	Malta & Mediterranean ... Metropolitan (of Melbourne)	6½—7	...	...
392,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	78—83	...	...
171,978	Stk.	Aug. 24	5	5	M. S. D. Utility "C." Cons.	76—81	...	78½—78½
718,657	"	"	4	4	Do. 4 p.c. Cons. Pref.	67—72	...	...
112,126	"	g	4	4	Do. 4 p.c. Deb. ...	70—75	...	...
148,955	"	g	5	5	Do. 5 p.c. Deb. ...	90—95	...	...
675,000	"	May 21	16	16	Montevideo, Ltd.	70—80	...	...
2,061,315	"	Aug. 10	5⅔	5	Newcastle & Gateshead Con.	16/—17/-[d/]	...	...
682,856	"	"	4	4	Do. 4 p.c. Pref. ...	67—69[d]	...	...
691,705	"	Jan. 4	3½	3½	Do. 3½ p.c. Deb. ...	68—70[d]	...	...
277,285	"	Oct. 30	5	5	Do. 5 p.c. Red. Deb.	96—98[d]	...	...
199,940	"	Aug. 24	7½	7½	North Middlesex 6 p.c. Con.	105—110	...	...
396,160	"	Aug. 10	5	5	Northampton 5 p.c. max. ...	74—79	...	...
300,000	"	Nov. 30	7	9	Oriental, Ltd.	88—98	...	...
60,000	5	13 May, '15	—	—	Ottoman	0—¼	...	...
205,162	Stk.	Jan. 4	8	8	Plym'th & Stonehouse 5 p.c.	114—119	...	...
504,416	"	Aug. 24	8	8	Portsm'th Con.Stk. 4 p.c.Std.	119—124	...	...
241,446	"	"	5	5	Do. 5 p.c. max. ...	76—79	...	...
686,312	"	Jan. 18	4	4	Primitiva 4 p.c. Rd. Db. 1911	75—85	...	...
389,813	"	Jan. 4	4	4	Do. 4 p.c. Cons. Deb.	75—85	...	...
150,000	10	Sept. 21	6	6	San Paulo 6 p.c. Pref. ...	7½—8	...	...
1,736,968	Stk.	Sept. 7	6½	6	Sheffield Cons.	103—105[e]	...	...
95,000	"	Jan. 18	4	4	Do. 4 p.c. Deb.	79—81[e]	...	...
133,201	"	Sept. 7	5	8½	Shrewsbury 5 p.c. Ord. ...	90—95	...	...
90,000	10	June 11	15	15	South African	3¾—5¼	...	3⅞—9⅛
6,709,895	Stk.	July 23	7½	5	South Met. Ord.	95—99	...	97—98⅜
1,135,812	"	"	6	6	Do. 6 p.c. Irred. Pf.	103—108	...	105⅜—106
1,895,445	"	Jan. 4	3	3	Do. 3 p.c. Deb. ...	55—60	+1	56—58
1,000,000	"	Jan. 18	4	5	Do. 5 p.c. Red. Deb.	93—98	...	...
91,500	"	Aug. 10	8½	8½	South Shields Con.	108—110[d]	...	...
1,543,795	"	Aug. 10	6¾	6¾	South Suburban Ord. 5 p.c.	101—106	+1½	103½—105
668,837	"	Jan. 4	5	5	Do. 5 p.c. Deb.	90—95	...	93½—95
647,740	"	Aug. 24	5	5	Southampt'n Ord. 5 p.c. max.	77—80	...	...
121,275	"	Jan. 4	4	4	Do. 4 p.c. Deb.	70—75	...	...
250,000	"	Aug. 24	7	7	Swansea 7 p.c. Red. Pref. ...	96—99	...	...
200,000	"	Jan. 4	6½	6½	Do. 6½ p.c. Red. Deb.	98—101	...	...
1,076,490	"	Aug. 10	6¾	6¾	Tottenham and District Ord.	103—107	...	104—105
150,000	"	"	5½	5½	Do. 5½ p.c. Pref. ...	93—98	...	...
199,005	"	Dec. 14	4	4	Do. 4 p.c. Deb. ...	71—76	...	...
85,701	"	Sept. 21	6	6	Tuscan, Ltd., 6 p.c. Red. Db.	72—77	...	...
310,694	"	Aug. 24	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	102—107	...	104½—105
86,390	"	"	5	5	Do. 5 p.c. Pref. ...	85—90	...	89½—90
1,322,220	"	July 9	7	7	Wandsworth and District: Consolidated	110—114	...	110½—112
971,373	"	"	5	5	Do. 5 p.c. Pref.	90—95	...	...
1,167,964	"	Jan. 4	5	5	Do. 5 p.c. Deb.	92—97	...	93½—95½

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *f.*—The quotation is per £1 of stock. *g* The interest due 1/1/32 was paid on that date. * Ex. div. † Paid free of income-tax. ‡ For year. § Div. =10 p.c.t. p.a. less tax and less tax on interim dividend.

COMPANY NOTICES.

SOUTHGATE AND DISTRICT GAS COMPANY.

NOTICE OF GENERAL MEETING.

NOTICE is Hereby Given that the ANNUAL GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Thursday, the 3rd day of March, 1932, at 3 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Year ended the 31st of December, 1931; to declare Dividends; to elect a Director; to elect an Auditor; to approve and confirm the establishment by the Directors of a Contributory Pensions Fund; and for Other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 19th of February to the 3rd of March, 1932, both days inclusive.

By order,
HYDE C. BURTON,
Secretary.

Secretary's Office:
5, Great Winchester Street,
Old Broad Street, London, E.C. 2,
Feb. 9, 1932.

NORTH MIDDLESEX GAS COMPANY.

NOTICE OF GENERAL MEETING.

NOTICE is Hereby Given that the ANNUAL GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Monday, the 29th day of February, 1932, at 2.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Year ended the 31st of December, 1931; to declare Dividends; to elect two Directors; to elect an Auditor; to approve and confirm the establishment by the Directors of a Contributory Pensions Fund; and for Other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 16th to the 29th of February, 1932, both days inclusive.

By order,
HYDE C. BURTON,
Secretary.

Secretary's Office:
5, Great Winchester Street,
Old Broad Street, London, E.C. 2,
Feb. 9, 1932.

BRIGHTON, HOVE, AND WORTHING GAS COMPANY.

NOTICE OF GENERAL MEETING.

NOTICE is Hereby Given that the ANNUAL GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, in the City of London, on Friday, the 4th day of March, 1932, at 2.30 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Year ended the 31st of December, 1931; to declare Dividends; to elect two Directors; to elect an Auditor; to appoint a Special Auditor; to determine the remuneration of the Auditors; and for Other Purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 20th of February to the 4th of March, 1932, both days inclusive.

By order,
HYDE C. BURTON,
Secretary.

Secretary's Office:
5, Great Winchester Street,
Old Broad Street, London, E.C. 2,
Feb. 9, 1932.

UXBRIDGE, MAIDENHEAD, WYCOMBE, AND DISTRICT GAS COMPANY.

NOTICE is Hereby Given that the SEVENTY-FIRST ORDINARY GENERAL MEETING of the Company will be held at 159-162, Palace Chambers, Bridge Street, Westminster, S.W. 1, on Thursday, the 25th day of February, 1932, at 2.30 p.m.

To receive the Directors' Report and the Accounts of the Company for the Year ended the 31st of December, 1931.
To declare a Dividend for the Year.
To elect Directors.
To elect an Auditor and fix the Auditors' remuneration.
To transact the General Business of the Company.

The STOCK TRANSFER BOOKS of this Company WILL BE CLOSED from the 15th to the 29th day of February, 1932, both inclusive.

By order of the Board,
GEORGE J. BRISTOW,
Secretary.

Uxbridge,
Jan. 28, 1932.

GAS MARKETS & MANUFACTURES

Stock Market Report.

[For Stock and Share List, see earlier page.]

The important political events of last week had little effect on the Stock Exchange. Money is scarce at the moment for any appreciable influx of buying orders. The outlook, however, is decidedly more cheerful, and with some alleviation from our international troubles a marked improvement would very quickly be established. Investors who have funds they can afford to lock up for a time would do well to take advantage of the low prices now prevailing in many sections.

Gas stocks and shares were much in evidence last week. The reports and accounts of the various undertakings which have so far been published show that, despite the financial and industrial depressions of last year, business has continued to increase. It is true that slight reductions in dividends have been necessary in a few instances, but for the most part these have either been maintained or increased. The results as a whole, therefore, have created a very favourable impression, and, as will be seen from the Stock and Share List, the prices of some of the more popular issues hardened last week in consequence. Gas Light £1 units were particularly in demand, and changed hands during the week at prices ranging from 18s. 1½d. to 19s. 6d. on Saturday last.

Among last week's ordinary dividend announcements appeared the following:

—	First Half.	Second Half.	Year 1931.	Year 1930.
	P.Ct.	P.Ct.	P.Ct.	P.Ct.
Cardiff	3	3	6	6
Croydon sliding-scale	3½	3¾	7	7
East Surrey	2⅞	2⅞	5¾	5½
Maidstone	4	5	9	9
Portsmouth, 4 p.ct.	4	4	8	8
Southampton	2½	2½	5	5
South Suburban	3¼	3	6¼	6½

Current Sales of Gas Products.

The London Market for Tar and Tar Products.

LONDON, *Feb.* 8.

There is no change in the values of tar products, and prices remain steady.

Pitch is firm at 85s. per ton f.o.b.

Creosote, for export, varies from 3¾d. to 5d. per gallon f.o.b., according to the specification.

Pure toluole is about 2s. 8d. per gallon at makers' works; pure benzole, 1s. 8d. to 1s. 9d. per gallon; 95/160 solvent naphtha, about 1s. 5d. per gallon; and pyridine bases, 90/140, about 3s. 9d. to 4s. per gallon.

Tar Products in the Provinces.

Feb. 8.

The average prices of gas-works products during the week were: Gas-works tar, 36s. to 41s. Pitch—East Coast, 75s. to 80s. f.o.b. West Coast—Manchester, Liverpool, Clyde, 75s. to 80s. f.o.b.* Toluole, naked, North, 1s. 10½d. to 1s. 11d. Coal-tar crude naphtha, in bulk, North, 5d. to 5¼d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 11d. to 11½d. Creosote, *ex* works, in bulk, North, liquid and salty, 3½d. to 3¾d.; low gravity, 1¼d.; Scotland, 3½d. to 3¾d. Heavy oils, in bulk, North, 5d. to 5½d. Carbolic acid, 60's, 1s. 7½d. to 1s. 8d. Naphthalene, £9 to £10. Salts, 55s. to 75s. bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

* All prices for pitch are now quoted on the basis of f.o.b. In order to arrive at the f.a.s. value at any port it will be necessary to deduct the loading costs and the tolls whatever they may be.

Tar Products in Scotland.

GLASGOW, *Feb.* 6.

Business is restricted owing to a temporary scarcity of many products. Cresylic acid and solvents, however, remain plentiful.

Pitch.—The home market is looking after production, and distillers are now obtaining 75s. to 77s. 6d. per ton *ex* works for available supplies. Export price is nominal at 72s. 6d. to 75s. per ton f.o.b. Glasgow.

Refined tar to Ministry of Transport Specification is steady at 4d. to 4½d. per gallon *ex* makers' works in buyers' packages.

Creosote oil.—Conditions are unaltered, with prices steady. B.E.S.A. Specification is 3d. to 3¼d. per gallon; low gravity, 3½d. to 3¾d. per gallon; and neutral oil, 3½d. to 3¾d. per gallon—all *ex* works in bulk.

Cresylic.—Values are lower, but orders remain scarce. Pale, 97/99 p.ct., is 1s. 1½d. to 1s. 2½d. per gallon; dark, 97/99 p.ct., 1s. 0½d. to 1s. 1½d. per gallon; and pale, 99/100 p.ct., 1s. 3½d. to 1s. 4d. per gallon—all *ex* works.

Crude naphtha.—The market is steady at 4½d. to 5d. per gallon f.o.r. in bulk, according to grade.

Solvent naphtha.—Few orders are being received. 90/160 grade is 1s. 3d. to 1s. 4d. per gallon, and 90/190 grade 1s. to 1s. 1d. per gallon.

Motor benzole is dull at 1s. 3d. to 1s. 4d. per gallon f.o.r. in buyers' tanks.

Pyridines.—90/160 grade is 3s. to 3s. 3d. per gallon, and 90/140 grade 3s. 3d. to 3s. 6d. per gallon.

Benzole Prices.

These are considered to be the market prices for benzole at the present time:

	s.	d.		s.	d.	
Crude benzole	0	7	to	0	7½	per gallon at works
Motor ,,	1	2	,,	1	3	,, ,, ,,
Pure ,,	1	6	,,	1	7	,, ,, ,,

Contracts Advertised To-Day.

Coal.

The Plymouth Corporation invite tenders for the supply of coal. [Advert. on p. 320.]

Mantles.

The Plymouth Corporation invite tenders for the supply of gas mantles. [Advert. on p. 320.]

"**My Hopeful Anticipations** of the reports of the leading gas companies are being fully justified by the figures now appearing." Thus a correspondent of the "Evening Standard" when commenting upon the dividend announcement of the Gas Light and Coke Company. "The old-established Gas Light and Coke Company," he continued, "is maintaining its dividend at £5 12s. p.ct. for the third successive year, and shows an increased carry-forward. I regard this as a distinctly satisfactory performance, seeing that 1931 was a difficult year. For the investor looking for a steady 6 p.ct. on his money I recommend Gas Light and Coke £1 units at to-day's price of 18s. 9d. This still includes the final dividend of £2 16s. p.ct. gross, equivalent to just over 6½d. gross per unit of stock. I like the progress of this undertaking, and the happy combination of alert management with conservative finance."

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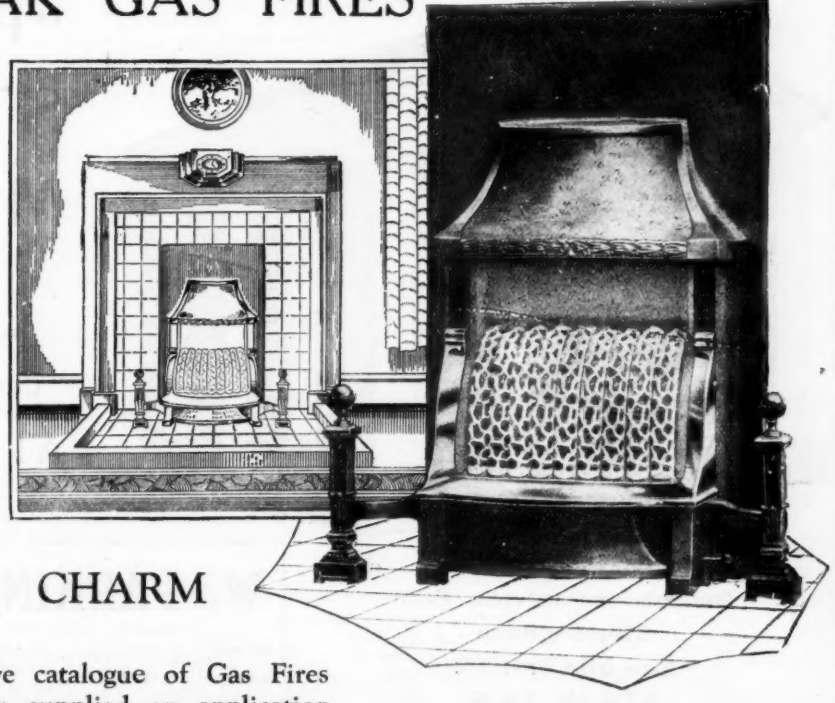

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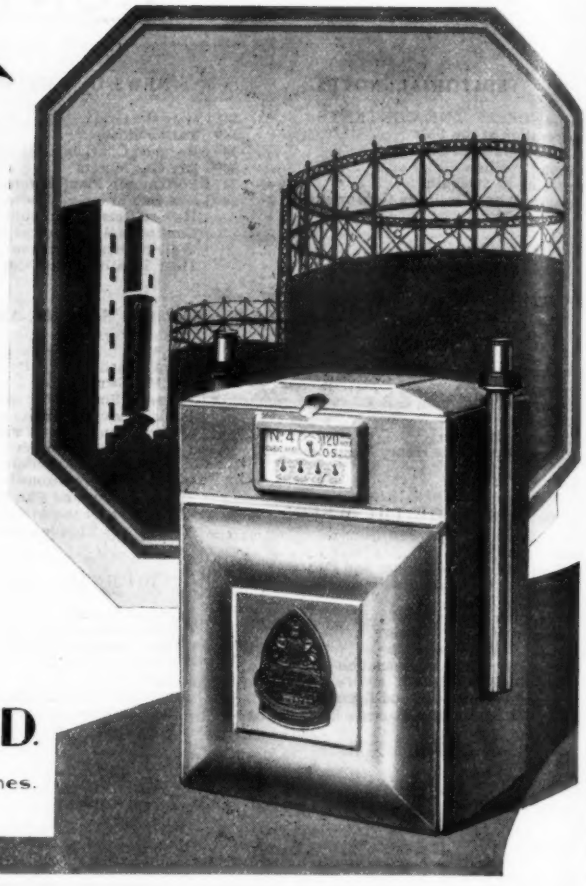

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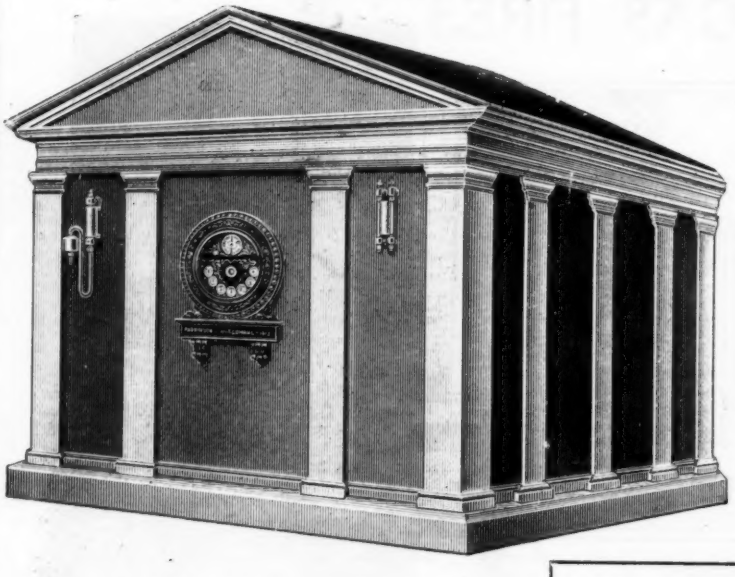

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